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THESIS

UNIT COSTING AT THE NAVAL POSTGRADUATE SCHOOL

by

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and
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June, 1991

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Unit Costing at the Naval Postgraduate School

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ABSTRACT

The purpose of this thesis is to discuss the implementation of unit costing at the Naval Postgraduate School (NPS). The research focuses on establishing a methodology to translate current financial accounting data at NPS into a format suitable to support the objectives of unit costing; specifically, improved visibility of the total cost of school operations and determination of the cost per graduate. Additionally, an overview of the new Department of Defense unit cost budgeting and resourcing system is included.

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I. INTRODUCTION

A. BACKGROUND

The impetus for this study was the issuance of the Unit Cost Resourcing Guidance in October 1990 by the Department of Defense (DOD). Unit Costing is part of DOD's overall plan to increase effectiveness and efficiency within the department and is intended to provide managers with an additional tool to effectively manage resources. Specifically, unit costing provides an opportunity for management to review the allocation of resources to determine whether they are being effectively utilized, by identifying the type and amount of expenses associated with producing a given output. We approached this study assuming that the implementation of unit costing is a forgone conclusion and do not attempt to justify its usefulness.

The DOD unit cost initiative has been in development for a number of years, and has been implemented for some activities. However, unit costing has not yet been implemented at the Naval Postgraduate School (NPS). This thesis attempts to develop a unit cost framework applicable to NPS that reflects the intentions of the Unit Cost Resourcing Guidance and our best judgments.

B. OBJECTIVE

The purpose of this study is to examine existing financial and statistical data at NPS to develop a unit cost report, which we call a cost matrix, that facilitates visibility and control of expenditures and allows the costs of specified outputs to be determined. The report is thus a tool for fiscal resource budgeting and control.

In order to efficiently utilize resources it is necessary to understand the relationship between expenditures and outputs, that is, how a given expenditure affects the cost of an output. To facilitate an understanding of this relationship, cost drivers must be identified and aggregated with respect to a specific output measure. The financial accounting structure at NPS was not intended to serve this purpose and thus our cost report attempts to correct this shortcoming by using available financial data to identify and monitor those cost drivers.

In creating the framework for our report we use the term "costing" to denote the cost determination process. Before costing can begin, however, it is necessary that the purposes of cost information be clearly defined. Once the purposes are outlined, then the cost objectives, costing units, cost classifications, and the financial accounting data used to provide desired cost information can be specified.

C. OUTPUT UNIT

The unit costing process is intended to determine the cost associated with producing a unit of output within an organization and therefore requires that the output be explicitly defined. The output should be directly related to the mission of the organization, that is, what the organization is intended to accomplish.

Graduates have been mandated as the primary output for training commands and this is discussed in detail in Chapters II and III. However, NPS does more than produce graduates. The school also performs a number of other functions, such as faculty research, that do not involve the production of graduates. We will attempt to determine what these functions are and incorporate their related costs in our framework. Some of these functions may not lend themselves to quantifiable measures of output and thus we may be unable to determine an output unit cost for them. However, our intent is to provide maximum visibility of the total costs of NPS operations so that the school's fiscal resources can be better managed.

D. THE RESEARCH QUESTIONS

Several questions arise with regard to the implementation of unit costing at NPS. First, what expenditures should be included in the costs to produce graduates?

Second, although the mandated measure of output for DOD training installations is graduates, how should the number of graduates at NPS be determined? As we will point out later, the school produces its graduates in an uneven flow due to varying curricula lengths and this must be accounted for in determining a graduate count for a given time period.

Third, as previously mentioned, faculty research may be considered a primary function of NPS. Can the output from research be measured, and if so, can this be applied to NPS for the purposes of unit costing?

Finally, the unit costing process at NPS requires translating existing financial accounting data into cost accounting data. The financial accounting system at NPS tracks expenditures within appropriation categories and is concerned with maintaining expenditures at or below authorized funded amounts. It does not, however, track the costs to educate students. Can the financial accounting system of NPS be adapted for the purposes of unit cost accounting?

E. SCOPE AND LIMITATIONS

Our framework attempts to utilize existing financial accounting data to determine unit cost at NPS, rather than developing a separate cost accounting system to capture the cost per graduate. Financial accounting requirements will remain after the implementation of unit costing and establishing a separate cost accounting system would be burdensome and

costly. Additionally, we did not have sufficient time to design a completely new accounting system and therefore confined our efforts to the use of available data from the school's financial accounting system.

When we began our study we assumed that DOD and the Department of the Navy would have made more progress in delineating specific procedures for implementing unit costing at training facilities in general and NPS in particular. Unfortunately, this was not the case. The supplement to the Unit Cost Resourcing Guidance regarding training activities is still in work. Thus, in creating our framework we were forced to make a number of assumptions with regard to the collection of data and the format of our matrix. We address these assumptions in Chapters III and IV. The end result is that our cost report is an exhaustive "first shot" at implementing unit costing at NPS, and we make no claim that the cost per graduate determined in this thesis will match that determined by other official DOD means.

F. PREVIEW OF CHAPTERS

A brief discussion of the remaining chapters is outlined below.

1. Chapter II. Unit Costing in the Department of Defense

This chapter provides a brief history of why and how unit costing is being implemented in DOD. The Unit Cost Resourcing Guidance, which is the vehicle for implementation

of unit costing, is reviewed. Also some of the pitfalls of unit costing are addressed, particularly with regard to the problem of measuring output from research.

2. Chapter III. Methodology

This chapter introduces our cost matrix and describes the research methods and techniques that were used to perform our field work. We discuss the mission and academic organization at NPS and our selection of cost objects. We also describe our sources of cost data and address how we classified costs. Finally, limitations on our cost data are addressed.

3. Chapter IV. Completion of the Cost Matrix

This chapter describes the step by step process we used to translate available financial data into unit cost accounting data. The completed cost report is presented and an estimate of the cost per NPS graduate is made.

4. Chapter V. Summary, Conclusions and Recommendations

In this chapter, our conclusions and recommendations are outlined. Suggested topics for further research are also discussed.

II. UNIT COSTING IN THE DEPARTMENT OF DEFENSE

A. INTRODUCTION

The purpose of this chapter is to discuss the concept of unit costing and its implementation within the Department of Defense. We begin by defining unit costing and explaining the reasons for its implementation. Next, the accounting procedures of unit costing are introduced. This is followed by a discussion of how unit costing will affect budgets and funding for activities in the defense department. Finally, we point out some of the shortcomings of unit costing and indicate where current instructions might be improved.

It is important to note that unit costing is a very recent initiative for the Department of Defense. The final draft of the official guidance from the defense comptroller was released in October 1990. Thus, study of how to best initiate and utilize unit costing is ongoing.

B. WHAT IS UNIT COSTING?

Unit costing is an initiative by the Department of Defense (DOD) to implement full cost accounting whereby data are collected to measure the total costs, or resources consumed, to produce the product or output of an activity. Total costs include all direct, indirect, and general and administrative expenses. The output, such as the number of graduates from a

training activity, can be likened to a final cost object. Accurate determination of the total cost per unit of output for DOD activities is desired in order to conduct efficient budgeting (prediction of funding requirements based on expected workload) and resourcing (actual funding based on actual workload).

C. WHY IS DOD IMPLEMENTING UNIT COSTING?

The decline of defense budgets in the 1990's is inevitable. The diminished Soviet threat coupled with the need to curtail federal expenditures in order to reduce the budget deficit has placed pressure on DOD to significantly cut spending. Defense expenditures are typically reduced in four ways. First, the acquisition of new weapon systems may be scaled back or stretched out over a longer period of time. The idea is to spend fewer dollars on new systems each year.

Second, a "vertical cut" can be made in the defense weapons inventory. Such a reduction involves the complete removal or retirement of a particular weapon system. Savings result from reductions in total required manpower and operations and maintenance expense. The decommissioning and "mothballing" of all Navy battleships is an example of a vertical spending cut.

Third, a "horizontal cut" or partial removal of a system or funding for a program or programs may be made. The decision to reduce the active aircraft carrier fleet from 15

to 12 ships is an example of a horizontal cut. Another example of this type of cut would be a reduction in funding for aircraft flight hours. The net result is that pilots would fly fewer hours per fiscal year, and the government would save on fuel, spare parts, and other related maintenance and operation costs. [Ref. 1:pp. 3-4]

Finally, defense expenditures may be reduced by making efficiency or productivity gains. The goal here is to eliminate waste and improve efficiency. The implementation of unit costing is designed to support this goal by enhancing the visibility of all costs that are incurred in the production of an output and to contribute to better management of scarce fiscal resources. Perhaps the strongest argument in support of unit costing is that such a system should encourage defense managers to scrutinize <u>all</u> costs in terms of the mission and output of an organization. In his guidance on unit costing to the military departments, the DOD Comptroller noted that:

> ...unit costs will not directly provide a cost savings--it will help to better identify costs, but not eliminate them. However, recognition of total costs coupled with greater flexibility to manage costs provides the opportunity for improvement. [Ref. 2:p. 2]

Thus, determining an accurate cost per unit of output will give managers a tool that will allow them to identify areas of their operations for improvement and more accurately measure subsequent improved efficiency. Additionally, unit costs will also serve as resourcing and budgeting tools to aid in more accurately funding DOD activities in response to actual

workload, and budgeting funds based on anticipated workload. This point will be addressed in more detail below.

D. UNIT COSTING PROCEDURES

1. Output Measures

The DOD comptroller has categorized measures of activity outputs into two types, "primary" and "other." Primary outputs reflect the overall mission of an organization. For example, the Naval Postgraduate School exists to produce officer graduates with master's degrees to fulfill subspecialty training requirements of the Department of the Navy. Additionally, the school conducts significant faculty research that benefits the DOD and DON. Thus the primary outputs are twofold: graduates and research. Other outputs reflect tasks performed that are not in support of the primary mission. In the case of NPS, the school provides support to a number of tennant organizations that are not involved in the production of graduates with subspecialty codes of the conduct of research. Most notably these include the Defense Resources Management Education Center and the Fleet Numerical Oceanography Center. Although a number of outputs may be identified for any activity, the sum of the costs of an organization's primary and other outputs should equal the total cost of operations. [Ref. 2:p. 5]

A selection of DOD functions that have been targeted for unit cost implementation are listed in Table 2-1 with their

TABLE 2-1

OUTPUT MEASURES FOR SELECTED DOD FUNCTIONS

Function	Output Measure
Supply Depots	Cost Per Item Received
	Cost Per Item Shipped
Supply Operations (Inventory Control Point)	Cost Per Gross Stock Fund Sale
Military Recruiting	Cost Per Contracted Enlisted Workyear
	Cost Per Medical Officer Recruited
	Cost Per Officer Candidate Recruited
Military Training	Cost Per Officer Candidate Graduate
	Cost Per Specialized Training Graduate
	Cost Per Undergraduate Pilot Graduate
	Cost Per Professional Development Education Graduate
	Cost per Recruit Training Graduate
Commissaries	Appropriated Funds Cost Per Dollar Sales
	Stock Fund Cost Per Dollar Sales
	Trust Fund Cost Per Dollar Sales
Health Care	Cost Per Medical Work Unit

Note: NPS falls under the military training function, but produces Professional Development Education graduates only.

associated primary output measures. The identification of additional DOD functions and their outputs for implementation of unit costing is presently ongoing. [Ref. 3]

2. Cost Classifications

a. Direct, Indirect, and G&A

Included in the cost for each output are direct, indirect, and general and administrative (G&A) expenses. Direct costs are those costs clearly identified with a single product or output. Indirect costs are those mission costs which benefit two or more outputs, but not all outputs, and cannot be clearly identified to a specific output. Costs which are incurred for the benefit of all outputs are G&A costs. These costs are essentially overhead because they cannot be reasonably associated with specific products and are allocated over all of the outputs. [Ref. 2:pp. 7-8]

For example, a direct cost at NPS would be the cost of an instructor's salary. An indirect cost might be the expenditures necessary to support a computer lab that is available to all curricula for instruction or research, but is not used to support tennant activities. A G&A cost would be the cost of the base fire department since all of the school's outputs benefit from this service.

b. Military Labor

Although the costs of civilian labor has always been included in DOD accounting, budgeting, and resourcing for individual activities, the cost of military personnel has been

regarded, until recently, as "free." In other words, organizations using military personnel were not charged for their labor and had no responsibility to fund those personnel. Accounting, budgeting and resourcing of military pay has traditionally been addressed at the congressional appropriations level only. Since funding for military personnel was not within the control of individual organizations, there has been no incentive to evaluate alternative labor sources and their impact on total costs. [Ref. 4:p. 8] Since unit costing is aimed at enhancing cost visibility and capturing the total cost of producing an output, DOD guidance mandates identification and allocation of military personnel expenses for all DOD functions. Military pay may be classified as either direct, indirect, or G&A, depending upon an individual's position in an organization and impact on specific outputs. Military pay expense is calculated as follows:

MILPAY Expense	= Average Number of Assigned Military Personnel by Paygrade	X	Composite Pay Rate by Paygrade

The composite pay rate is a weighted average figure computed for every officer and enlisted paygrade by military service. Each military department in DOD has been tasked with developing pay rates by paygrade so that the rates include basic pay, retirement accruals, housing and subsistence allowances, special pay, incentive pay, and permanent change

of station funding. In the Department of the Navy, NAVCOMPT Notice 7041, dated 10 December 1990, fulfills this purpose.

As an example, assume that an activity uses the direct labor of one Ensign (0-1), two Chief Petty Officers (E-7), and five seaman (E-3) to provide an output. The military pay expense for providing this output would be calculated as follows:

1	X	Payrate (0-1)
		+
2	X	Payrate (E-7)
		+
5	X	Payrate (E-3)
		Total Military Labor Expense

c. Capital Budgets and Depreciation

In addition to capturing the costs of military pay in the production of DOD activity outputs, unit costing mandates the inclusion of depreciation expenses as an operating cost for assets installed on or after 1 October 1990. Capital investments are defined as items costing $15,000 or more with a useful life greater than or equal to two years and includes augmentation and mobilization stocks in supply operations and real property maintenance or improvement projects. [Ref. 2:p. 6] Land, however, is not subject to depreciation.

Depreciation will be calculated on a straight-line basis. The cost of an asset will include the acquisition price plus any set-up costs. The service life is

predetermined by the asset's category. Salvage value is set at 10% of the initial capitalized amount unless purchasing activities determine that an alternative value is more appropriate. Table 2-2 is a listing of example asset categories and their approved service lives. [Ref. 2:pp. 13-14]

TABLE 2-2

DEPRECIABLE LIVES FOR SELECTED CAPITAL INVESTMENTS

Asset Category	Max Useful Life
Buildings (includes significant improvements)	20 years
Structures and Facilities (e.g., fixed cranes or automated warehouse retrieval systems)	20 years
Leasehold Improvements (includes modifications to leased buildings, structures or facilities that materially add to their lives, productivity or efficiency. Does not include routine repair or maintenance)	20 years
Industrial Plant Equipment	10 years
Office Furnishings and Equipment	10 years
General Purpose Vehicles	5 years
Automated Data Processing (Hardware and Software)	5 years
Assets Under Capital Lease	(see applicable Asset Category)

Depreciation expenses may be classified as either direct or indirect or G&A depending upon the specific use of the asset in producing outputs. For example, the acquisition of a wind tunnel for an aerodynamics laboratory at NPS would benefit students in the aeronautics department only. Thus, depreciation on that particular equipment item would be a direct cost of producing graduates with an aeronautical engineering master's degree. On the other hand, the depreciated costs of expanding and upgrading the NPS library would be considered an indirect cost of producing graduates and conducting research in each academic department since all students and faculty would benefit to some degree from improvements to the library. Finally, the construction costs of a new parking facility that would benefit all persons working on campus would be depreciated as a G&A expense since all NPS departments and tennant activities would benefit.

3. Cost Aggregation and Allocation

The Defense Manpower Data Center (DMDC), located in Monterey, California, is the agency charged with managing the DOD unit cost data base. Historical accounting information from activities performing functions targeted for unit cost implementation is collected and placed in the following format for each identified output: [Ref. 3]

Military and Civilian Labor Expense
Direct
Indirect

(+)

Non-Labor Costs
Direct
Indirect

(+)

Allocated G&A Costs
Total Cost

$$\text{Unit Cost} = \frac{\text{Total Cost}}{\text{Total Workload in Units}} = \frac{\text{Cost}}{\text{Unit}}$$

Allocation bases for indirect cost are left to the judgment of individual activities and we propose an indirect cost allocation scheme for NPS in detail in Chapter IV. However, the DOD unit cost guidance requires that G&A expenses be allocated on the basis of total personnel (military and civilian) associated with or assigned to producing an output. The guidance also indicates that further study of other possible G&A allocation bases is ongoing. [Ref. 2:p. 16]

An analysis of historical data in the format described above will be used to establish unit cost goals for DOD activities. In the case of NPS, the school will be assigned a cost per graduate goal. This figure will be the mechanism used in budgeting for anticipated requirements and resourcing actual needs as discussed below.

E. BUDGETING AND RESOURCING UNDER UNIT COSTING

As previously mentioned, budgeting involves predicting funding requirements based on anticipated workload while resourcing is the actual allocation of funds based on actual workload. Workload refers to the total units or outputs produced over a given period of time--normally a fiscal year.

Unit cost goals issued by the DOD comptroller are used in conjunction with anticipated workload to formulate activity budgets. For example, assume the cost goal for NPS graduates with degrees in management is $10,000 per graduate. Additionally, assume the school anticipates producing 100 graduates throughout the budget period. Thus the NPS budget for management graduates would be:

$$\frac{\text{cost}}{\text{unit}} \times \text{predicted workload} =$$

$$\frac{\$10,000}{\text{graduate}} \times 100 \text{ graduates} = \$1,000,000$$

However, under unit costing, budgetary resources are "earned" only as workload materializes. In other words the obligation of funds may occur only in conjunction with actual outputs. In the above example if only 90 graduates were produced, the school would be permitted to spend only:

$$\frac{\$10,000}{\text{graduate}} \times 90 \text{ graduates} = \$900,000$$

Similarly, if 110 students were graduated, NPS would be allowed to obligate $1,100,000.

Recall that unit cost goals are developed from historical cost accumulations and are not based on the actual current costs per output. Thus, if NPS spent $10,100 per graduate to produce 100 graduates, the school would still be permitted to obligate only $1,000,000. This policy is intended to encourage managers to control or more closely monitor cost drivers and highlights a critical difference between budgeting and resourcing under unit costing and the current DOD practice of "bottom line" budgeting. Bottom line budgeting allows managers a fixed amount of funds for use during a given period regardless of actual output. If workload does not materialize as predicted, then available resources are "fat" and there is no incentive to scrutinize costs. [Ref. 1:p. 1] This practice also encourages managers to seek the largest budgets possible to cushion periods of extraordinary activity. Unfortunately it seems this is reinforced in DOD in that often the most successful and highly rewarded managers are those who are able to secure the largest possible budgets. By contrast, unit costing is intended to support an environment that stresses a focus on total costs and rewards efficient management. [Ref. 4:p. 5]

F. DRAWBACKS OF UNIT COSTING

Although unit costing is intended to enhance overall efficiency and encourage improved cost management, there are drawbacks which managers should understand. These drawbacks include the recognition of the relationship between variable and fixed costs, the impact of changing levels of output on consolidation, and finally, the treatment of activity outputs that do not lend themselves to quantifiable measure.

1. Fixed Costs

In the budgeting and resourcing example cited above it was assumed that total costs and workload are directly proportional. The implication is that all costs are treated as variable. Managers must recognize however that the relationship between outputs is more complex. For example, assume a training activity had in the past executed a budget of $30,000,000 to graduate 2000 students. This yields a unit cost goal of:

$$\frac{\$30,000,000}{2000 \text{ Graduates}} = \$15,000 \text{ per graduate}$$

Further assume that half of the $30,000,000 of prior spending represented fixed costs. If the workload of this training activity falls to 1000 graduates, current unit cost guidance requires a funding reduction from $30,000,000 to:

$$\frac{\$15,000}{\text{Graduate}} \times 1000 \text{ Graduates} = \$15,000,000$$

However, since fixed costs remain unchanged, a reduction in output would cause the current actual unit cost to rise from $15,000 per graduate to:

$$\frac{\text{Fixed}}{\$15,000,000} + \frac{\text{Variable}}{.5(\$15,000,000)} = \frac{\$22,500}{\text{Graduate}}$$
$$1000 \text{ Graduates}$$

Thus, in order to cover all of the activity's cost, the level of funding should fall from $30,000,000 to only:

$$\frac{\$22,500}{\text{Graduate}} \times 1000 \text{ Graduates} = \$22,500,000$$

The difference of $22,500,000 - $15,000,000 = $7,500,000 represents the funding shortfall that could occur if consideration were not given to the fact that fixed cost, within a certain range, will not change with output. [Ref. 5:p. 2] This point is further developed in Figure 2-1.

Consider the hypothetical situation depicted below in Figure 2-1.

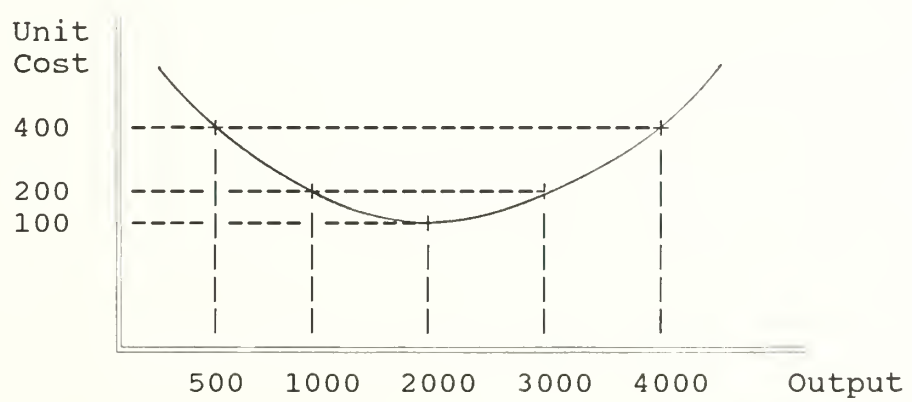

Figure 2-1 Hypothetical Average Total Cost Curve

The average total cost (or unit cost) curve is U-shaped which depicts both the impact of fixed costs and the law of diminishreturns on the unit cost. Within a certain range, fixed costs do not change as output changes. Thus, average fixed costs decline steadily with increases in output. This results in unit costs that are high for low levels of output and decreasing as output increases. This is the case for output levels of 500-2000 in Figure 2-1. However, costs per unit will decrease only to a certain level, as indicated at output 2000. At this point the law of diminishing returns causes unit costs to increase since all available capacity has been utilized. At output 2000, employees, equipment, and facilities may be tasked to their maximum capable level. Any additional demand for output will require investment in new plant and equipment and hiring of additional employees. In turn, maintenance, repair, labor, and capital expenses will increase. Ultimately, this will result in increased fixed and variable costs. The net result will be an increase in average unit costs. [Ref. 6:pp. 20-21] The DOD Unit Cost Guidance acknowledges this situation and indicates that further research will be conducted to better identify and allow for the fixed component of total cost and the impact of diminishing returns. However, the Guidance also indicates that until the distinctions between fixed and variable costs are better defined, funding will fluctuate with workload as if all costs are variable. [Ref. 2:p. 9]

2. Consolidation

Implementing unit costing techniques may yield opportunities for cost savings through the consolidation of activities. For example, since both the Department of the Army and Department of the Navy conduct undergraduate helicopter pilot training, it might be cost effective to determine the cost per graduate of both training activities and then consolidate training at the activity exhibiting the lower unit cost. Conceptually, this idea has much appeal. However, a complete understanding of the behavior of unit costs with respect to output for each activity is required in order to make an optimal decision regarding consolidation.

Consider the following hypothetical example in Figure 2-2. Assume activities A and B produce a similar output and that A is smaller than B. Both A's and B's unit cost curves are shown in Figure 2-2.

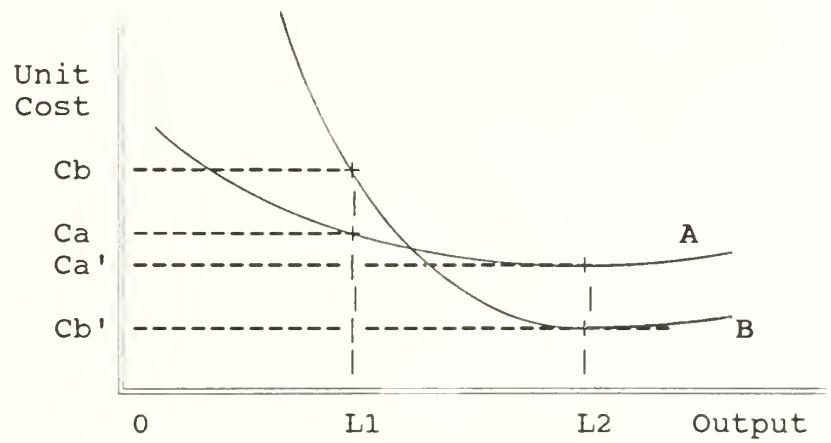

Figure 2-2 Hypothetical Unit Cost Curves for Activities A and B

Further assume that both activities are producing L1 units. The total output for activities A and B is then L2. The unit cost for A is given by Ca. Similarly, Cb represents the unit cost for B. Considering output for each activity at L1 suggests that A is the more efficient organization because it has the lower unit cost. This may persuade managers to disestablish activity B and increase the output of A to L2. While this will result in a lower unit cost of Ca', it is not the optimal solution. At L2, activity B yields the lowest cost per unit as indicated by Cb'. This is because A is a smaller activity than B and thus has less capacity to accommodate additional output. Thus, the point of diminishing returns is reached at a lower output for A than for B. [Ref. 6:p. 23]

Failure to adequately investigate the behavior of unit cost functions can lead managers to make decisions which result in less than optimal results. The point here is that the manager must know how unit costs change for each activity in question when considering consolidation. The unit cost guidance does not address this issue, but it could be improved by including examples similar to the economic analysis presented above. Training for senior DOD managers would also help ensure broad recognition of this potential shortcoming in the use of unit costing. Additionally, it may be appropriate to task DMDC or commission studies to determine unit cost curve approximations for various DOD activities through

statistical analysis. Improvements to the Unit Cost Guidance, training, and statistical study of activities will better enable DOD managers to effectively utilize unit costing.

3. Output Measures that Cannot be Easily Quantified

The DOD unit cost guidance hints that there are functions for which a specific output is difficult to define but does not outline adequate methods to identify and measure "non-standard" output. Non-standard output can be defined as output which is not easily measured quantitatively, and can be manifested as both "primary" and "other." Activities whose output is considered non-standard present problems to managers who must decide how output is to be measured and utilized for budgeting and resourcing.

The best example of a function with non-standard output is research and development. Although the mandated primary output at NPS is graduates, faculty research must certainly be considered a primary output. In terms of unit costing this raises two questions. First, should research be subject to similar unit costing measures as functions with easily quantifiable outputs? Second, if so, how can these outputs best be measured and used for budgeting and resourcing?

Attempting to measure research output presents certain problems. Participants in research, by nature, are interested in pursuing knowledge without being bound by budgetary restrictions or performance measurements. Ideally researchers

want to perform in a "no questions asked" environment. [Ref. 7:p. 33] However, the drive for greater DOD efficiency makes this ideal environment for researchers more difficult to provide.

This problem has been addressed thoroughly in civilian industries. Hajime Mitarai, Research Director for Canon Incorporated, expressed a view shared by many researchers.

> There is so much talk about how to manage researchers...and how to maximize return on investment. That's baloney. Researchers know what to do. You can give [research] managers a mission, but all you can do as manager is provide a good environment and trust your researchers. [Ref. 7:p. 33]

At General Motors efforts have been made from time to time to measure research performance with return on investment criteria. Said GM's vice president for research Robert A. Frosch,

> We twice tried to estimate the return on investment of the research lab by trying to identify things transferred to the rest of the company that provided dollar benefits. Most turned out to be cost savings but some we couldn't get data on. Still, the ones we couldn't get yielded a very large return on investment. [Ref. 7:p. 34]

Developing a standard measurement that can be used universally seems to be elusive. Ian Ross of AT&T Bell Laboratories stated,

> It's difficult to measure the payoffs for research because they are so large and come so much later, as was the case with transistors. With really good basic research, you're limited in the number of people who can do it, say, one or two rather than 10. So the payoff is tremendous when you have a hit. [Ref. 7:p. 34]

He added, "We evaluate R&D qualitatively and semi-qualitatively, rather than by normal financial return on investment criteria."

Despite a general feeling that research may not best be measured quantitatively, DOD managers may be forced to do so to satisfy DOD unit cost budgeting and resourcing goals. The task becomes one of finding appropriate measures. In academia, one widely recognized method of evaluating individual output is by tallying published work. The question arises though, how can the significance of published work be evaluated quantitatively?

S.J. Liebowitz and J.P. Palmer attempted to answer this question by developing a model which first rated the journals in which an economic academic's work would appear. Their model works in the following way. Economics journals are ranked in order, by the total number of citations that authors make to those journals in their published work. The journals used in ranking are almost all of those which might be used by academic economists. In essence, the rankings reflect a journal's accumulated impact on current authors. [Ref. 8:p. 77]

To illustrate, in 1980, The Journal of Economic Literature may have been cited a total of 100 times in published work in all other relevant economics journals. Thus it would receive a score of 100. The Journal of Political Economics may have been cited 74 times and would receive a

relevant score of 74. Using the relevant scores, journals can then be ranked in order. Table 2-3 provides a partial list of journals ranked by Liebowitz and Palmer in 1980. It is important to point out that the description of the Liebowitz/ Palmer model presented above has been simplified for the purposes of this paper. The authors discuss additional considerations that went into designing the model such as the relative age and the "fit" of some of the journals (i.e., Yale Law Journal) within the economic community.

TABLE 2-3

IMPACT OF JOURNALS' RANKINGS BASED ON CITATIONS IN 1980

Rank	Journal	Citations
1.	American Economic Review	100.00
2.	Journal of the American Statistical Association	81.57
3.	Journal of Political Economy	78.45
4.	Econometrica	71.51
5.	Yale Law Journal	55.06
6.	Review of Economic Statisticians	39.02
7.	Journal of Finance	31.93

Now, given quantified values for the journals, an association with an academic's published work can be made. A weighted average of the total of work published by a researcher is one approach. For example, if a researcher had two articles published in the Journal of Finance, and one article published in the American Economic Review, using

values from Table 2-3, a weighted average attributable to the researcher's published work could be calculated as:

$$100.00(.33) + 31.93(.67) = 48.41$$

In the same manner, the work of all researchers could be measured, thus providing a means of quantifiably ranking their work. Additionally, this information could be aggregated by academic departments and reviewed over time to gauge fluctuations in output. Fluctuations in output could then be used to budget and resource research functions.

This example, of course, only addresses a possible method to measure and ultimately budget and resource research functions at an academic institution. The Unit Cost Guidance does not specify a measure of output for activities that conduct research and a more complete discussion of the measurement of research output is beyond the scope of this thesis. In the following chapters we seek to identify to the total costs of instructing students and conducting research at NPS. However, we will estimate the cost per output of instruction only since we do not have a clear output unit for research.

In closing this chapter we comment on our selection of an appropriate instruction output measure for NPS. Recall from Table 2-1 that the mandated output measure for training activities is number of graduates. However, measuring the number of graduates at NPS is difficult in that the academic

programs that produce graduates vary in length. For example, most management curricula last 18 months, but engineering curricula can last two and a half years or more. Thus, counting the number of graduates in a given year would not accurately reflect the workload in that year. Since academic curricula are of varying length, simply counting the number of graduates would either understate or overstate the actual workload. For this reason we elected to measure graduate output on the basis of average number of students onboard per year. We recognize that such a measure is a surrogate for the DOD specified output, but we believe this technique more accurately reflects the school's workload. To determine average students onboard we will sum total students onboard per quarter over the course of a fiscal year and divide by four. At the end of Chapter IV we use available data to make this calculation and estimate of the cost per "graduate" (i.e., average onboard student) for instruction.

III. METHODOLOGY

A. INTRODUCTION

The focus of our research is the translation of current financial accounting and statistical data at NPS into a format suitable to support the objectives of unit costing; specifically, maximum cost visibility and determination of the cost per graduate student. In doing this we studied relevant literature, conducted field research, and interviewed key personnel. In this chapter we discuss the development of a framework to provide maximum cost visibility at NPS.

B. UNIT COST REPORTING

Exhibit 3-1 is an example of an actual unit cost report issued by DMDC for an unnamed DOD facility. Note that costs are separated into labor, non-labor, and G&A. Also note that labor and non-labor costs are subdivided into direct and indirect components. Recall from Chapter II, Table 2-1, that military training activities within DOD are categorized by output, namely graduates from recruit training, specialized skill training, officer acquisition, flight training, and professional development education. Note that these categories are the cost objects[1] listed in the left most

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[1]A cost object, or objective, is any end or entity to which a cost is assigned. This may be a product, output, or department. We use the terms "object" and "objective" interchangeably.

COST PER OUTPUT REPORTING SYSTEM
COSTS AND WORKLOAD ANALYSIS REPORT

VERSION 1.0
RUN DATE: 03/19/91
RUN TIME: 11:09:48

	LABOR				NON-LABOR		ALLOCATED	TOTAL	WORKLOAD
	CIV DIR	CIV IND	MIL DIR	MIL IND	DIRECT	INDIRECT	G&A COSTS	COSTS	
UNIT COST OUTPUTS									
RECRUIT	25,427	159,480	167,671	397,087	0	235,452	0	985,117	
UNIT COST-RECRUIT	.00	.00	.00	.00	.00	.00	.00	.00	
SPECIALIZED SKILL	51,578	3,091,438	366,768	6,233,066	362,810	12,112,573	0	22,218,232	
UNIT COST-SPECIALIZ	.00	.00	.00	.00	.00	.00	.00	.00	
OFFICER ACQUISITION	0	0	0	0	14,332	0	0	14,332	
UNIT COST-OFFICER A	.00	.00	.00	.00	.00	.00	.00	.00	
FLIGHT	681,057	7,947,322	8,941,531	19,787,860	7,710,689	11,733,166	0	56,801,624	
UNIT COST-FLIGHT	.00	.00	.00	.00	.00	.00	.00	.00	
PROFESSIONAL DEVELO	0	1,173,109	1,420,396	2,920,898	72,664	1,731,940	0	7,319,007	
UNIT COST-PROFESSIO	.00	.00	.00	.00	.00	.00	.00	.00	
TOT UC FUNCTIONS	758,062	12,371,349	10,896,366	29,338,910	8,160,495	25,813,131	0	87,338,312	
UC-TOT TRAINING	.00	.00	.00	.00	.00	.00	.00	.00	
OTHER OUTPUTS									
LANGUAGE	0	0	0	0	12,317	0	0	12,317	
TOT OTHER OUTPUTS	0	0	0	0	12,317	0	0	12,317	
TOTAL TRAINING	758,062	12,371,349	10,896,366	29,338,910	8,172,812	25,813,131	0	87,350,629	

Notes: 1. Figures in dollars.

2. In obtaining this report from DMDC we were asked to delete the name of the activity depicted for purposes of publication.

Exhibit 3-1 Unit Cost Report for an Example DOD Activity

column of Exhibit 3-1. Thus, for the installation depicted in this exhibit, all costs are collected by the specific military training functions that are conducted.

The Defense Manpower Data Center has yet to generate a unit cost report for NPS similar to Exhibit 3-1. However, according to representatives from the SECDEF Unit Cost Task Group such a report would assign all costs (labor, non-labor, G&A) to only one cost object, namely, professional development education.[2] This is the only type of military training conducted by NPS. Clearly, this limited breakdown of information would not be useful to NPS management because it would not provide detailed visibility of cost by school function. Thus, our objective is to formulate a matrix similar to Exhibit 3-1, but with a more detailed and useful set of appropriate cost objects. Additionally, we must examine available labor and non-labor fiscal data and determine which costs are direct, indirect, and G&A, and decide how they will be assigned to cost objects.

C. COST OBJECTS AT NPS

As noted above, the Naval Postgraduate School conducts professional development education. However, the school does

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[2]From an interview conducted in March 1991 with Ms. Susan Grant, Office of the Secretary of Defense (Comptroller). [Ref. 9] Ms Grant is the chairperson of the task group assigned to write the Military Training Appendix to the Unit Cost Guidance.

more than educate DOD personnel as indicated in the School's mission statement:

> The Naval Postgraduate School exists for the sole purpose of increasing the combat effectiveness of the Navy and Marine Corps. It accomplishes this by providing post-baccalaureate degree and non-degree programs in a variety of subspecialty areas not available through other educational institutions. The school also supports the Navy through continuing programs of naval and maritime research and through the maintenance of an expert faculty capable of working in, or as advisors to, operational commands, laboratories, systems commands, and headquarters activities of the Navy and Marine Corps. [Ref. 10]

Thus, the primary mission of NPS is composed of two parts: instruction of students and faculty research. Additionally, as mentioned in Chapter II, the school provides goods and services support to 14 tennant activities as a secondary mission. These activities are listed in Table 3-1.

Since the school's mission is essentially threefold, i.e., instruction, research, and tennant support, a framework similar to Exhibit 3-1 should depict each of these as cost objects. In other words, costs should be collected in a manner that clearly shows how much is being spent on each of the three aspects of the school's mission. However, in the case of instruction and research a further breakdown is desirable in order to provide greater cost visibility. Specifically, it would benefit school managers to know how much was being spent on instruction and research in each academic discipline. Thus, in terms of research and instruction, cost objects should be set forth in a manner that best reflects specific areas of academic endeavor. In the

TABLE 3-1

NAVAL POSTGRADUATE SCHOOL TENNANT ACTIVITIES

Activity	Abbreviation
Defense Manpower Data Center	DMDC
Dental Branch Clinic	Dental
Defense Investigative Service	DIS
Defense Resources Management Education Center	DRMEC
Fleet Numerical Oceanography Center	FLENUMOCEANCEN
Naval Medical Detachment	NAVMED
Naval Reserve Center	NAVRESCEN
Naval Oceanographic and Atmospheric Research Laboratory	NOARL
Naval Security Group	NAVSECGROUP
Naval Investigative Service	NIS
Naval Telecommunications Center	NTCC
Defense Personnel Security Research and Education Center	Perserec
Personnel Support Detachment	PSD
TRADOC Analysis Command	TRADOC

next paragraphs we discuss the organization of academic pursuits at NPS, our selection of cost objects, and introduce our cost visibility matrix.

1. Academic Organization at NPS

As reflected in the mission statement, the school exists to conduct instruction and research. The need for instruction springs from the existence of military billets that require graduate level education for successful performance. These billets are identified by Department of the Navy (DON) subspecialty codes. Thus, subspecialty codes

identify the skill areas necessary to meet billet requirements. They also represent areas of study and research that are of greatest interest and benefit to the Department of the Navy. The Naval Postgraduate School administers specific academic curricula to ensure that subspecialty code skill training requirements satisfy DON requirements. Graduate degrees, which essentially indicate the completion of subspecialty skill training, are awarded by curricula. Table 3-2 lists the curricula administered at NPS, their associated subspecialty codes, and degree offerings.

To support course work in the various curricula, faculty at NPS are organized by academic department and in some cases by academic group. Each of the 11 departments represents an essentially separate academic discipline. An academic group is a less formal organization than an academic department. There are four academic groups and each is an interdisciplinary association of faculty that has administrative responsibility for the academic content of curricula that have unique requirements. For example, the Space Systems academic group has administrative oversight of the Space Systems Operations and Space Systems Engineering curricula. However, each professor serving in an academic group has an appointment to one of the academic departments. Thus, faculty promotions and salaries are administered at the department level only. According the Director of Academic Planning, each academic group is paired with a "parent" department on the

TABLE 3-2

CURRICULA ADMINISTERED AT NPS

Curriculum Title	Subspecialty Code	Degree
Operations Analysis	XX42P	MS Operations Research
Operational Logistics	XX43P	MS Operations Research
Joint Command, Control and Communications (C3)	XX45P	MS Systems Tech. (C3)
Space Systems Operations	XX76P	MS Systems Tech. (Space Sys. Ops.)
Computer Systems Management	XX95P	MS Information Systems
Computer Science	XX91P	MS Computer Science
Meteorology	XX48D	PhD Only for USN Officers
Air-Ocean Sciences	XX47P	MS Meteorology and Physical Oceanography
Operational Oceanography	XX49P	MS Meteorology and Physical Oceanography
Advanced Science (Applied Mathematics)	XX41P	MS Applied Mathematics
Oceanography	XX49D	PhD Only for USN Officers
Hydrographic Science	NONE	MS Hydrographic Sciences
Antisubmarine Warfare Systems	XX44P	MS Applied Science
Weapons Systems Eng.	XX61P	MS Eng. Science
Weapons Systems Sciences (Physics)	XX63P	MS Physics
Nuclear Physics (Weapons & Effects)	XX67P	MS Physics
Underwater Acoustics	XX56P	MS Eng. Acoustics
Naval/Mechanical Eng.	XX54P	MS Mechanical Eng.
Electronic Systems Eng.	XX55P	MS Electrical Eng.
Space Systems Eng.	XX77P	MS (Various)
Electronic Warfare Systems Eng.	XX46P	MS Systems Eng.

TABLE 3-2 (CONTINUED)

Curriculum Title	Subspecialty Code	Degree
Electronic Warfare Systems for Allied Officers		MS Systems Eng.
Communications Eng.	XX81P	MS Electrical Eng.
Aeronautical Eng.	XX71P	MS Aeronautical Eng.
Aeronautical Eng. Avionics	XX72P	MS Aeronautical Eng.
Telecommunications Systems Management	XX82P	MS Telecommunications Systems Management
National Security Affairs (Middle East, Africa, South Asia)	XX21P	MA Nat. Sec. Affairs
National Security Affairs (Far East, Southeast Asia, Pacific)	XX22P	MA Nat. Sec. Affairs
National Security Affairs (Europe, USSR)	XX24P	MA Nat. Sec. Affairs
National Security Affairs (International Org. & Negotiations)	XX25P	MA Nat. Sec. Affairs
National Security Affairs (Western Hemisphere)	XX23P	MA Nat. Sec. Affairs
National Security Affairs (Strategic Planning, General)	XX26P	MA Nat. Sec. Affairs
National Security Affairs (Strategic Planning, Nuclear)	XX27P	MA Nat. Sec. Affairs
Trans. Logistics Mgt.	1304P	MS Management
Trans. Management	XX35P	MS Management
Acquisition & Cont. Mgt.	1306P	MS Management
Systems Inv. Management	1302P	MS Management
Intelligence	XX17P	MS Nat. Sec. Affairs
Mat. Log. Sup. Mgt.	XX32P	MS Management
Financial Management	XX31P	MS Management
Manpower, Personnel & Training Analysis	XX33P	MS Management

basis of faculty department assignments. We did not investigate the appropriateness of the "parent" assignment, but for ease of data collection we followed this identification of academic groups with academic departments. Table 3-3 lists the academic departments at NPS and indicates academic group-department associations.

TABLE 3-3

ACADEMIC DEPARTMENTS AND RELATED ACADEMIC GROUPS AT NPS

Academic Department	Related Academic Group	Group Code	Department Code
Aeronautics and Astronautics			AA
Administrative Sciences	Command, Control Communication (Joint)	CC	AS
Computer Science			CS
Electrical and Computer Eng.	Space Systems	SP	EC
Math			MA
Mechanical Eng.			ME
Meteorology			MR
National Sec. Affairs	Electronic Warfare	EW	NS
Oceanography			OC
Opns. Research	Anti-Submarine Warfare	AW	OR
Physics			PH

2. Selection of Cost Objects

Recall that cost objects should reflect each of the three aspects of the school's mission (i.e., instruction,

research, and tennant support) and that a further subdivision of cost objects for instruction and research is desirable. Ideally, the subdivision cost objects for both research and instruction should be the individual academic curricula since graduate degrees and subspecialty codes are awarded on this basis. Additionally, research in these specific subject areas is of interest to the Navy. Thus a delineation of cost objects on the basis of curricula would be very much in consonance with the execution of the school's primary mission. However, the accounting system at NPS does not collect or assign costs on the basis of curricula. Instead, academic endeavors are controlled and funded through academic departments. In turn each academic department may support one or more curricula. For example the Math department administers only one curricula, but the Administrative Sciences department administers nine. Since data are readily available for each academic department, we selected them as subdivision cost objects to provide greater cost visibility for the primary mission areas of instruction and research. Tennant support, as a secondary mission cost object is not further subdivided. In the next paragraph we introduce our framework for improving cost visibility.

3. The Matrix

Figure 3-1, hereafter referred to as the "matrix," is the framework we adopted for providing maximum cost visibility to support the objectives of unit costing. Compare the matrix

to Exhibit 3-1 and note that the cost classifications for the columns are identical. Further note that the cost objects are listed in the left-most column of the matrix. These reflect the three mission areas and subdivision of the instruction and research missions by academic department. (See codes in Table 3-3).

The numbers in the matrix we call blocks. Notice that certain blocks represent a particular classification and type of cost. For example, blocks 1 through 11 represent the total direct civilian labor costs for instruction and provide visibility of these costs in each academic department. Our objective in Chapter IV is to utilize available NPS fiscal data to fill in each block. Once the matrix is complete we use the aggregated data in conjunction with our determination of average onboard students to estimate the cost per graduate. Before we proceed, however, some preliminary comments regarding our sources of fiscal data and our assumptions are necessary.

D. COST CLASSIFICATIONS AT NPS

1. Direct, Indirect, and G&A Costs

Having selected our cost objects, we examined the fiscal system at NPS in order to identify and classify cost data as direct, indirect, and G&A. Recall, from Chapter II that direct costs are those which are clearly related to a single product or mission output. Indirect costs are related

	LABOR				NON-LABOR		G&A	TOTAL
	Civ		Mil					
	Dir	Ind	Dir	Ind	Dir	Ind		
Primary:								
Instruction								
AA	1	23	45	67	89	111	133	
AS	2	24	46	68	90	112	134	
CS	3	25	47	69	91	113	135	
EC	4	26	48	70	92	114	136	
MA	5	27	49	71	93	115	137	
ME	6	28	50	72	94	116	138	
MR	7	29	51	73	95	117	139	
NS	8	30	52	74	96	118	140	
OC	9	31	53	75	97	119	141	
OR	10	32	54	76	98	120	142	
PH	11	33	55	77	99	121	143	
Total								
Research								
AA	12	34	56	78	100	122	144	
AS	13	35	57	79	101	123	145	
CS	14	36	58	80	102	124	146	
EC	15	37	59	81	103	125	147	
MA	16	38	60	82	104	126	148	
ME	17	39	61	83	105	127	149	
MR	18	40	62	84	106	128	150	
NS	19	41	63	85	107	129	151	
OC	20	42	64	86	108	130	152	
OR	21	43	65	87	109	131	153	
PH	22	44	66	88	110	132	154	
Total								
Other:								
Tennant Support							155	

Figure 3-1 NPS Unit Cost Matrix

to some but not all mission outputs, and G&A costs are incurred for the benefit of all mission outputs. In light of our selection of cost objects, we further define a direct cost as one which can be clearly related to a specific academic department for either instruction or research or both. Indirect costs are those which may be related to the mission areas of either or both instruction and research, but cannot be assigned to a specific academic department. G&A costs are those incurred to the benefit of instruction, research and tennant support. Clearly, indirect and G&A costs will have to be allocated to the academic departments. We discuss the methodologies for this in Chapter IV.

As mentioned previously the accounting system at NPS was not designed to implement unit costing or support aggregation of data in a format similar to our matrix. Thus, our task was to extract such data as are available, classify as direct, indirect, or G&A, and allocate to our cost objects as appropriate.

2. Sources of Cost Data

Fiscal planning and control at NPS is conducted through central military and civilian administrators known as line managers. Each line manager has responsibility for a specific area of school operations. Fiscal data is thus aggregated by line manager. Since we define direct costs as those costs which can be clearly associated with a specific academic department for research or instruction, our task was

to classify the expenditures of individual line managers as either indirect or G&A. In the following paragraphs we identify each of the nine line managers (LM) and classify the costs of their operations. We should note here that some components of the line manager organization described below were introduced in October 1990. This caused some complications in extracting cost data. We discuss those difficulties at the end of this chapter.

a. LM 00: Office of the Superintendent

The Superintendent is responsible for the overall conduct of all three school mission areas and thus has an impact on instruction, research, and tennant support. Accordingly, the costs associated with LM 00 are considered G&A.

b. LM 01: Office of the Provost

The Provost oversees all academic activity at NPS and thus has an impact on the instruction and research mission areas. However, he is not involved in tennant support activities. Therefore, LM 01 costs are classified as indirect and will be allocated to academic departments for both instruction and research.

c. LM 02: Director of Resource Management

This office is responsible for overall management of the school's fiscal resources. All three mission areas benefit from the services provided from LM 02 and thus these costs are considered G&A.

d. LM 03: Director of Students and Programs

Overall management of curricula and supervision of students is conducted from this office. Thus, LM 03 is concerned primarily with the instruction of students and has little to do with research. Therefore, costs associated with this office are considered indirect for instruction only.

e. LM 04: Director of Military Operations

The Director is essentially the commanding officer of the physical installation at NPS and is responsible for providing support functions such as public works, supply, police and fire departments. These functions benefit all mission areas and thus the costs for LM 04 are considered G&A since they are incurred for the benefit of all outputs.

f. LM 05: Dean of Information/Computer Services

The Dean administers all data processing conducted by the NPS computer center. Additionally, he is responsible for overseeing the school's library. The school's mainframe computer is used to support academic work, but is also extensively utilized by many tennant activities, most notably DMDC. The library obviously supports academic instruction and research, but is also available for use by tennant activities such as DRMEC. Since LM 05 benefits all three mission areas, the costs associated with this office are considered G&A.

g. LM 06: Dean of Instruction

Effective October, 1990, this office controls scheduling functions related to the instruction of students

such as admissions, the registrar, and course scheduling. Since LM 06 costs relate only to the instruction mission area, we consider them to be indirect costs to be allocated to academic departments for instruction only.

h. LM 07: Dean of Faculty and Graduate Studies

The Dean is responsible for overall control of academic department personnel workload and tracks how much time is devoted to research and instruction by academic department. As will be seen in Chapter IV many of the costs associated with LM 07 may be classified as direct since these costs can be clearly associated with specific academic departments for instruction and research. However, the costs of the Dean's immediate office cannot be clearly associated with individual academic departments and are thus allocated as indirect costs to instruction and research.

i. LM 08: Dean of Research

Effective October 1990, the Dean's position was created. This office controls assignment and funding of research projects. This includes both direct funded research through NPS funding and reimbursable research paid for by research sponsors. Since costs in this office are related to only one mission area, we consider them indirect and will be allocated to academic departments for research only.

3. Limitations on Cost Data

a. Fiscal Year 90-91 Data Sources

To the extent possible we used FY90 fiscal documents to extract cost information in completing the matrix. However, as will be seen in Chapter IV we used FY91 projected labor expenditures for non-faculty labor data in order to reflect the line manager organization that became effective in October 1990. The impact of the new line manager scheme was to create separate Deans of Instruction and Research. We felt it necessary to show how cost data for these two new line managers could be extracted and incorporated in the matrix. Had we used FY90 data exclusively we could not have separately identified labor expenditures associated with LM 06 and LM 08 in their present organizational form. We recognize that this incongruity taints the determination of an accurate historical cost per graduate for FY90, but we felt it was more important to demonstrate how the costs of all current line managers would be incorporated in completing our cost matrix. The various reports which served as sources of data will introduced in Chapter IV.

b. Capital Budget

As of June 1991 construction continues on various campus buildings. Ideally, we should incorporate the construction and subsequent depreciation costs of qualifying improvements in our cost matrix, but due to limitations of

time and available data we elected not to explore this issue. We do, however, recommend it as a topic for further research in Chapter V.

c. Reimbursables

An emerging trend in DOD is the increased reliance on reimbursement agreements to cover the costs of support functions. Ideally, for example, NPS should be fully reimbursed for the cost of providing support to each tennant activity. While this is not yet the case, NPS is reimbursed for some of its support work. The remaining portion is handled through direct funds available in the NPS budget. Likewise, NPS should pay for goods and services provided by other activities such as PSD. However, this would require PSD to determine the full cost of its services and bill service users accordingly. Additionally, faculty research is moving towards greater reliance on reimbursement agreements. In such an arrangement the sponsoring government agency would reimburse NPS for all costs associated with a particular research project.

The difficulty we encountered in dealing with reimbursables lies in the question of their impact on the cost per unit of output. For example, if the school is completely reimbursed for the completion of a given research project, does the addition of that project change the school's cost per unit of conducting research? Consider the case of instructing foreign national students. Benefiting foreign governments pay for the costs of instructing their citizens at

NPS. This reimbursement money is known as Foreign Military Training (FMT). Since the school is reimbursed for these costs in advance, does the matriculation of additional foreign students alter the true cost per graduate with respect to the school's direct funded budget?

In our opinion we could not adequately explore this topic in the time available to complete our research and therefore confined our study to direct funded (i.e., appropriated) monies. The only exceptions to this were reimbursable research labor and that portion of instruction labor funds that were supported by FMT. According to the Director of Academic Planning, the data we gathered on the instruction component of faculty salaries contain FMT funds. However, we were unable to determine what percentage of instruction funds were composed of FMT dollars and thus were unable to delete those dollars from the total.

In the case of reimbursable research labor, we were able to separately identify and associate these funds by academic department. However, had we extracted the reimbursable portion of total research labor, the ratio of faculty effort devoted to research versus instruction would have been misstated. As can be seen in Chapter IV, this would have biased our indirect cost allocation scheme towards instruction. In light of these difficulties, we recommend study of NPS reimbursables, to include FMT, as a topic for further research in Chapter V.

IV. COMPLETION OF THE COST MATRIX

In this chapter we use available fiscal data to complete the unit cost matrix. Our approach involves four major sections. First, we discuss and identify direct labor and non-labor costs. Second, we address indirect costs. We do this by explaining our allocation scheme then identifying and allocating indirect labor and non-labor costs respectively. Thus, we discuss, identify and allocate G&A costs. Finally, we determine a cost per average onboard student for instruction.

A. DIRECT COSTS

1. Direct Labor Costs

Direct labor costs are represented by the salaries of personnel whose efforts can be clearly identified with the production of graduates and the conduct of research in each academic department. These personnel include civilian faculty, military instructors, lab technicians, and academic department clerical personnel. We first identify the portion of civilian salaries related to instruction.

a. Blocks 1-11: Civilian Direct Labor Costs for Instruction

Exhibit 4-1 is the completed fiscal year '90 (FY90) faculty budget plan. This document (and Exhibits 4-2, 4-7, and 4-8) was obtained from the Director of Academic Planning at NPS. As indicated, a breakdown of civilian faculty

	QTR 1			QTR 2			QTR 3			QTR 4			TOTALS				
	SAL 1	DT1	DR1	RR1	SAL 2	DT2	DR2	RR2	SAL 3	DT3	DR3	RR3	SAL4	DT4	DR4	RR4	DTT	DRT	DIR TOT	RRT	TOTAL
01 ADMIN		118912	1447	0		105180	0	0		105180	0	0		105408	0	0	434680	1447	436128	0	436128
52 CS		162136	124569	24904		210917	91287	25428		187615	107788	27104		218784	69525	30856	779451	393169	1172620	108292	1280912
53 MATH		298733	50225	17607		273099	95152	22057		263103	29883	79168		356917	45761	24022	1191852	221021	1412873	142854	1555727
54 AS		490949	151294	60484		605839	96005	77832		447464	187435	136553		536451	167577	133517	2080703	602311	2683015	408386	3091401
55 OR		322420	151330	43726		384346	110247	21777		342718	83898	128058		275150	161943	122680	1324635	507418	1832053	316241	2148294
56 NSA		234752	49654	20624		262685	45711	18171		231652	45479	38586		213474	60395	46083	942563	201238	1143801	123464	1267266
61 PHYS		266396	116562	30200		262880	122696	37558		260125	93196	58528		217145	125139	77423	1006545	457593	1464139	203709	1667847
62 ECE		307304	199510	56457		376375	177277	61314		351751	161444	67570		343125	216738	54617	1380556	754969	2135525	239958	2375483
63 METEOR		82784	96179	45272		110948	97776	22785		112964	100161	26363		102076	111478	22242	408773	405593	814366	116662	931027
67 AERO		208664	101200	9624		238633	102098	9542		185960	127369	47989		196465	140125	36706	829722	470793	1300514	103862	1404376
68 OCEAN		155013	128976	9341		126734	139031	16323		138079	117970	17246		101006	160200	12090	520833	546177	1067010	55000	1122010
69 ME		211512	139027	16478		271545	107055	44067		186021	152350	56315		242981	125114	49208	912060	523546	1435607	166069	1601676
034 AV SAF		28888	0	0		29923	0	0		29923	0	0		29319	0	0	118054	0	118054	0	118054
TOTAL		2888464	1309972	334717		3261106	1184334	356855		2842556	1206974	683480		2938301	1383995	609445	11930428	5085276	17015703	1984497	19000200
DIR TOT		4198436				4445440				4049531				4322297							
COMB TOT		4533154				4802295				4733010				4931742							

DTT = "Direct Teach" and indicates that portion of salaries related to Instruction.

DRT = "Direct Research" and indicates that portion of salaries funded by the NPS Research Budget.

RRT = "Reimbursable Research" and indicates that portion of salaries funded through reimbursable research.

Note: Figures do not include fringe benefit costs of 19.7%.

Exhibit 4-1 Faculty Salary Data by Academic Department. Figures in dollars.

labor costs is given by academic department for direct teaching (i.e., instruction) and research. This breakdown is determined from data collected by each academic department chairman who tracks the amount of time assigned faculty spend instructing and conducting research. Note that the tabulated costs do not include civilian faculty fringe benefit costs of 19.7%.[1] Exhibit 4-2 is a breakdown of costs associated with the Dean of Faculty and Graduate Studies (Line Manager Code 07). The figures for each academic department represent the labor of assigned clerical personnel and lab technicians. Similar to Exhibit 4-1, these costs are broken down by instruction and research, but do not include civilian staff fringe costs of 22.5%.

Matrix blocks 1-11 representing civilian direct labor costs for instruction were determined by first multiplying the figures in the "Direct Teach Total" (DTT) column in Exhibit 4-1 by 1.197. Second, the "Total Other" (OTT) figures for each academic department in Exhibit 4-2 were multiplied by 1.225. Summing these products by academic department yields total civilian direct labor for instruction costs. These calculations are summarized in Table 4-1.

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[1]Fringe benefits, or "Fringe," represent the cost of the government's share of civilian employee retirement, life insurance, health insurance, social security, and thrift savings plans.

FY-91 MISSION STAFF BUDGET PLAN/EXECUTION

SUM 07	QTR 1				QTR 2				QTR 3				QTR 4			TOTALS				
	OT1	DR1	RM1		OT2	DR2	RM2		OT3	DR3	RM3		OT4	DR4	RM4	OTT	DRT	DIR TO	RMT	TOTAL
07 ADM	11766	0	0	0	9833	0	0	0	10839	0	0	0	11006	0	0	43444	0	43444	0	43444
GROUPS	12361	0	38067	0	14134	0	38132	0	14365	0	38728	0	14586	0	39324	55445	0	55445	154251	209696
AA	108201	9117	8122	0	111674	7658	7216	0	98016	4229	27022	0	115336	4294	11612	433227	25298	458525	53971	512496
AS	30078	31849	11395	0	22402	21402	36982	0	33163	11971	39057	0	33600	12155	39729	119244	77378	196621	127162	323784
CS	98847	9074	4944	0	90255	9160	14417	0	81689	9303	13812	0	79306	9446	17661	350097	36984	387081	50833	437914
EC	117601	11516	15054	0	127658	9192	13844	0	122376	14080	15600	0	124258	7140	22996	491893	41929	533822	67495	601316
MA	11141	0	0	0	13796	0	2538	0	13186	825	4714	0	13389	838	4786	51512	1663	53175	12039	65213
ME	95006	0	0	0	88953	13879	0	0	86405	20247	0	0	87735	20559	0	358099	54686	412785	0	412785
MR	47178	85690	6877	0	42925	86413	12527	0	48250	65319	32658	0	48200	59757	39623	186553	297180	483733	91685	575418
NS	11704	1787	0	0	13890	0	0	0	11726	0	2157	0	13717	0	1947	51037	1787	52824	4104	56928
OC	67066	62383	6349	0	66642	52724	10692	0	68675	30120	30192	0	68421	37276	25133	270805	182503	453258	72367	525625
OR	73643	7827	0	0	78029	4540	9075	0	76654	4848	10042	0	78301	4922	9840	306628	22137	328764	28958	357722
PH	121647	43391	30358	0	107891	30728	51528	0	94189	36032	66122	0	99871	24481	76926	423598	134632	558230	224935	783166
TOTALS	806241	262632	121167	0	788082	235698	196951	0	759535	196975	280104	0	787726	180869	289578	3141584	876174	4017708	887800	4905507
DIR TOT	1068873				1023780				956510				968595							
COMB TOT	1190040				1220731				1236613				1258173							

O7 ADM = Represents the salaries of personnel in the immediate office of the Dean of Faculty and Graduate Studies.

Groups = Salaries of clerical personnel working in support of the Academic Groups.

DRT = "Direct Research Total" and represents the NPS funded portion of salaries related to research.

RMT = "Reimbursable Research Total" and represents the reimbursable portion of salaries related to research.

OTT = "Other Total" and indicates that portion of clerical/lab technicians salaries related to instruction.

Note: Figures do not include fringe benefit costs of 22.5%.

Exhibit 4-2 FY91 Non-faculty Staff Salary Data by Academic Department. Figures in dollars.

TABLE 4-1

CIVILIAN DIRECT LABOR COSTS FOR INSTRUCTION

	Faculty					+ Clerical Personnel and Lab Technicians					= Matrix Blocks 1-11
Dept	DTT	X	Fringe			OTT	X	Fringe			
AA	$829,722	X	1.197	=	$993,177	$433,227	X	1.225	=	$530,703	$1,523,880
AS	2,080,703	X	1.197	=	2,490,602	119,244	X	1.225	=	146,074	2,636,676
CS	779,451	X	1.197	=	933,003	350,097	X	1.225	=	428,869	1,361,872
EC	1,380,556	X	1.197	=	1,652,526	491,893	X	1.225	=	602,569	2,255,095
MA	1,191,852	X	1.197	=	1,426,647	51,512	X	1.225	=	63,102	1,489,749
ME	912,060	X	1.197	=	1,091,736	358,099	X	1.225	=	438,671	1,530,407
MR	408,773	X	1.197	=	489,301	186,553	X	1.225	=	228,527	717,828
NS	942,563	X	1.197	=	1,128,248	51,037	X	1.255	=	62,520	1,190,768
OC	520,833	X	1.197	=	623,437	270,805	X	1.225	=	331,736	955,173
OR	1,324,635	X	1.197	=	1,585,588	306,628	X	1.225	=	375,619	1,961,207
PH	1,006,545	X	1.197	=	1,204,834	423,598	X	1.225	=	518,908	1,723,742
										Total =	$17,346,397

Source: DTT data taken from Exhibit 4-1; OTT data taken from Exhibit 4-2.

b. Blocks 12-22: Civilian Direct Labor Costs for Research

Similar to the discussion above, we define direct civilian labor for research as the work faculty members, lab technicians, and clerical personnel perform on or in support of research projects. Thus, the cost of this labor is that portion of faculty, lab technicians, and secretarial salaries derived from research activities. Exhibit 4-1 separates the research component of faculty salaries into two parts: "Direct Research Total" (DRT) and "Reimbursable Research Total" (RRT). Direct research is funded from research monies that are a part of the annual NPS budget. Reimbursable research is sponsored by outside government organizations and is in effect "contract work." Similarly, Exhibit 4-2 separates academic department staff salaries into "Direct Research Total" (DRT) and "Reimbursable Research Total" (RMT) amounts.

To determine the total direct civilian labor costs for research, first we summed the DRT and RRT totals for each department in Exhibit 4-1 and applied the 1.197 fringe benefit multiplier. Second, we summed the DRT and RMT columns for each department in Exhibit 4-2 and applied the 1.225 multiplier. Adding the two products for each academic department yields the total direct civilian labor costs for research. These calculations are summarized in Table 4-2.

TABLE 4-2

CIVILIAN DIRECT LABOR COST FOR RESEARCH

Dept	(DRT	+ RRT)1.197 =	Total Faculty Research	+ (DRT	+ RMT)1.225 =	Total Staff Research	= Matrix Blocks 12-22
AA	$470,793	+ $103,862 =	$687,862	$25,298	+ $53,971 =	$97,104	$784,966
AS	602,311	+ 408,386 =	1,209,804	77,378	+ 127,162 =	250,562	1,460,366
CS	393,169	+ 108,292 =	600,249	36,984	+ 50,833 =	107,576	707,825
EC	754,969	+ 239,958 =	1,190,928	41,929	+ 67,495 =	134,044	1,324,972
MA	221,021	+ 142,854 =	435,558	1,663	+ 12,039 =	16,785	452,343
ME	523,546	+ 166,069 =	825,469	54,686	+ 0 =	66,990	892,459
MR	405,593	+ 11,662 =	625,139	297,180	+ 91,685 =	476,360	1,101,499
NS	201,233	+ 123,464 =	388,668	1,787	+ 4,104 =	7,216	395,884
OC	546,177	+ 55,000 =	719,609	182,503	+ 72,367 =	312,216	1,031,825
OR	507,418	+ 316,241 =	985,920	22,137	+ 28,958 =	62,591	1,048,511
PH	457,593	+ 203,709 =	791,578	134,632	+ 224,935 =	440,470	1,232,048
						Total =	$10,432,698

Source: (DRT + RRT) data taken from Exhibit 4-1; (DRT + RMT) data taken from Exhibit 4-2.

c. Blocks 45-55: Military Direct Labor Costs for Instruction

Military direct labor for instruction is represented by the pay of officers assigned to NPS as academic instructors. To determine this cost we obtained a listing of NPS military faculty as of April 1991 and applied the appropriate annual composite pay rates from NAVCOMPT Notice 7041, dated 10 December 1990. The results are summarized below in Table 4-3. We recognize that any listing of assigned military instructors represents only a "snapshot" of a given point in time. A better method would be to somehow determine an average time of assignment of military instructors by paygrade and academic department. This would reflect common personnel situations such as billet gaps or overmanning and yield figures that more accurately summarize the labor costs of officer instructor assignments over the course of a year. Unfortunately, we could not find data in such a format, but feel that using a current assignment list serves as an acceptable proxy.

d. Blocks 56-66: Military Direct Labor Costs for Research

The primary responsibility of military officers assigned to academic departments is instruction of students. Unlike civilian faculty, military officers are not usually involved in significant research. In some cases military faculty may be afforded the opportunity to participate in research projects, but this depends on the scheduling of

TABLE 4-3

MILITARY INSTRUCTOR SALARIES BY ACADEMIC DEPARTMENT

Acad Dept	# X Paygrade (Serv.)	X	Annual Composite Rate	= Total
AA	1 X 04 (USN)		$78,720	$78,720
	1 X 03 (USN		67,045	67,045
				145,765 = Block 45
AS	3 X 05 (USN)		92,824	278,472
	4 X 04 (USN)		78,720	314,880
				593,352 = Block 46
CS	2 X 05 (USN)		92,824	185,648
	2 X 04 (USN)		78,720	157,440
	1 X 04 (USAF)		79,746	79,746
	1 X 03 (USAF)		63,573	63,573
				486,407 = Block 51
EC	1 X 05 (USN)		92,824	92,824
	2 X 04 (USN)		78,720	157,440
	1 X 03 (USN)		67,045	67,045
	1 X 03 (USAF)		63,573	63,573
				380,882 = Block 52
MA	0		0	0 = Block 53
ME	0		0	0 = Block 54
MR	1 X 04 (USN)		78,720	78,720 = Block 55
NS	1 X 05 (USN)		92,824	92,824 = Block 56
OC	2 X 05 (USN)		92,824	185,648 = Block 57
OR	1 X 06 (USN)		109,474	109,474
	1 X 05 (USA)		93,276	93,276
	3 X 05 (USN)		92,824	278,472
	2 X 04 (USN)		78,720	157,440
	1 X 04 (USAF)		79,746	79,746
				718,408 = Block 58
PH	1 X 04 (USN)		78,720	78,720 = Block 55

Total Military Direct
Labor for Instruction = 2,760,726

individual instructors and, more importantly, the required teaching load. Thus, we define military direct labor costs for research as zero. This assumption may overstate the costs of instruction, but is necessary until a data base that better documents the specific efforts of military faculty is available. However, in making this assumption we do not believe that instruction costs are significantly overstated.

We should mention here that there are enlisted personnel at NPS who assist the academic departments. These personnel are usually technical specialist such as electricians or machinists and their work complements that of civilian lab technicians. However, there is no clear assignment of enlisted personnel to individual academic departments, nor can their labor be distinctly identified with either research or instruction activities. Additionally, these personnel are often called upon to perform other non-academic related work such as standing military watches. The question arises, "how much of their time and effort is devoted to which activities?" Since we could not determine a clear, consistent causal-beneficial relationship between this enlisted labor and the conduct of research and instruction by academic department, we felt it best to allocate the cost of their labor as G&A. This is discussed in our section on G&A costs.

2. Direct Non-Labor Costs

These costs include all non-labor costs that can be directly traced to a particular academic department. Non-labor funds are allocated to the nine line managers which were identified in Chapter III. Each line manager is treated as a separate cost center. These allocations take the form of a financial plan. Expenditures, on the other hand, are tracked in the Job Order Report.

The Job Order Report (JOR) consists of six sections: (1) direct funded research (DFR), (2) operations (NPS), (3) foreign military training (FM), (4) DRMEC (DR), (5) public affairs officer (PA), and (6) PERSEREC (PR). The operations (NPS) and direct funded research (DFR) sections are pertinent for determining which expenses can be directly traced to the academic departments. NPS funds are used by the academic departments to support instruction and DFR funds are intended to support direct funded research. Sections 4, 5 and 6, above, all receive separate budget allocations funded by DOD and are merely tracked by the comptroller's office for financial control. Accounting for Section 3 (FMT) was treated as reimbursable as discussed in Chapter III. Totals for the six sections are shown below:

Section	Description	Total
1	Direct Funded Research	$3,873,569
2	Operations (Instruction)	$7,347,154
3	Foreign Military Training	$1,346,204
4	DRMEC	$ 357,586
5	Public Affairs Office	$ 29,030
6	PERSEREC	$798,003

The expenditure of funds is tracked by sub-cost centers in the Job Order Report, for each of the sections indicated above. An example of this is shown in Exhibit 4-3.[2] The JOR is published monthly by the comptroller's office. Sub-cost centers can be traced to their appropriate cost center by using the Operating Budget Section Assigned Sub-Cost Centers List (Exhibit 4-4, included as Appendix A) for NPS funds. The Direct Funded Research Assigned Sub-Cost Centers List (Exhibit 4-5, included as Appendix B) performs the same function for DFR funds. The sub-cost center assignments also indicate a code for each sub-cost center. These codes are used for mailing inter-departmental correspondence, but in the case where these codes identify an academic department, the expenditures of that sub-cost center are directly attributed to that academic department.

The Job Orders Operating Budget List (Exhibit 4-6, included as Appendix C) breaks costs down by job order

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[2]Note that Exhibit 4-3 is an excerpt from the Job Order Report. We did not include the entire document due its size, but feel Exhibit 4-3 is a good example of the format of the report.

REPORT NO: MASLM600R2 NAVAL POSTGRADUATE SCHOOL PAGE NO: 4x
PREPARED : 02/12/91 COMPTROLLER'S OFFICE AS OF : 15:30:3n

SUB-COST CENTER - JOB ORDER REPORT

NOTE: THIS REPORT DOES NOT INCLUDE SUB-COST CENTERS WHICH BEGIN WITH THE LETTER 'F'.

ACTIVITY	SCC	JOB ORDER NUMBER		OPTAR OBLIGATED EXPENSE	TRAVEL OBLIGATED EXPENSE
NP	HD	F	OC	$ .00	$ 3,189.25
		L	00	30.00	.00
		P	MD	3,5[illegible].00	.00
		P	PD	18,795.10	.00
		P	PM	15,171.50	.00
		Q	00	1,5[illegible].00	.00
		Q	05	7,316.00	.00
		Q	00	341.60	.00
		T	00	1,035.60	.00
		T	05	676.03	.00
		T	NS	1,41[illegible].52	.00
		T	05	3,29[illegible].32	.00
		W	MA	4,[illegible]2.69	.00
		W	MD	10,4[illegible].93	.00
		W	PA	22,200.60	.00
*TOTAL HD				$ 97,530.49	$ 3,189.25
	HE	F	1T	.00	3,704.25
		F	OC	.00	10,5[illegible].00
		F	00	.00	1,269.80
		L	00	15.00	.00
		P	MM	4,30[illegible].69	.00
		P	PD	18,330.60	.00
		Q	00	1,3[illegible].00	.00
		Q	04	10,05[illegible].05	.00
		Q	05	42,717.71	.00
		Q	00	701.25	.00
		T	00	4,[illegible]3.48	.00
		T	05	2,3[illegible].64	.00
		T	NS	7,06[illegible].73	.00
		T	05	7,22[illegible].2	.00
		W	MA	3,71[illegible].58	.00
		W	MD	5,270.43	.00
		W	MG	3[illegible].25	.00
*TOTAL HE				$ 104,197.16	$ 15,512.14

Excerpt from Appendix A (Exhibit 4-4). The FY91 Operating budget section assigned sub-cost centers list.

CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER
AA	Aeronautics	07	HE

Note: By tracing the SCC identified in the Job Order Report to the Operating Budget Section assigned Sub-Cost Center list, it is possible to determine which academic department the expenses of that SCC should be allocated to. In this case, SCC expenses should be allocated to Cost 07, Code AA the Aeronautics department. Figures in the Job Order Report (NPS funds) for SCC HE can be found in Table 4-4.

Exhibit 4-3 Sub-Cost Center--Job Order Report

REPORT NO: MASLMGORP NAVAL POSTGRADUATE SCHOOL PAGE NO: 8
PREPARED : 02/12/91 COMPTROLLER'S OFFICE AS OF : 15:30:42

SUB-COST CENTER - JOB ORDER REPORT

NOTE: THIS REPORT DOES NOT INCLUDE SUB-COST CENTERS WHICH BEGIN WITH THE LETTER 'P'.

ACTIVITY	SCC	JOB ORDER NUMBER		OPTAR OBLIGATED EXPENSE		TRAVEL OBLIGATED EXPENSE
DF	TZ	F	TT	$ .00	$	657.37
		E	OC	.00		340.54
		L	00	3,364.00		.00
		2	GH	1,400.00		.00
		2	GJ	170.00		.00
		2	GK	2,074.00		.00
		T	GP	70.75		.00
		T	NS	65.83		.00
		T	00	2,304.45		.00
		*	GP	9,848.50		.00
		*	MP	7,179.18		.00
		*	PP	32,855.01		.00
		Y	00	450.00		.00
*TOTAL TZ				$ 59,949.32	$	997.91
	UA	E	OC	.00		43,146.03
		E	GM	.00		2,855.04
		L	00	31.67		.00
		Y	00	320.00		.00
		2	GJ	5,000.00		.00
		2	GK	104,160.23		.00
		T	GP	6,743.97		.00
		T	GS	1,204.45		.00
		T	NS	3,243.33		.00
		T	00	27,910.61		.00
		*	MA	3,084.80		.00
		*	MP	54,017.97		.00
		*	PA	.00		.00
		*	PP	24,000.00		.00
		Y	00	500.00		.00
*TOTAL	UA			$ 254,404.80	$	46,211.07

Excerpt from Appendix B (Exhibit 4-5). FY91 Direct funded research assigned sub-cost centers list.

CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER
AA	Aeronautics	12	UA

Note: By tracing the SCC identified in the Job Order Report to the Direct Funded Research Assigned Sub-Cost Center list, it is possible to determine which academic department the expenses of that SCC should be allocated to. In this case SCC expenses should be allocated to Code AA, the Aeronautics department. Figures in the Job Order Report (DFR funds) for SCC UA can be found in Table 4-5.

Exhibit 4-3 (CONTINUED)

numbers. These numbers indicate what the money was spent for in general terms. The report differentiates between travel and non-travel expenditures and totals job orders for both categories. Amounts indicated in Blocks 89-110 were derived by adding the two categories.

a. Blocks 89-99: Direct Non-Labor Costs for Instruction

As stated above, the NPS section of the Job Order Report contains those costs associated with instruction. However, the only non-labor cost that can be directly traced from a sub-cost center to a particular academic department for instruction are the expenses of line manager 07, the Dean of Faculty and Graduate Studies. The remaining sub-cost centers expenses could not be traced to a particular academic department. Consequently, with the exception of certain research expenses (which are discussed in the next paragraph), the cost of the remaining line managers were classified as indirect or (G&A) as outlined in Chapter III. Note that the numbers used to identify cost centers in the Job Order Report usually correspond to line manager codes. We shall use these interchangeably in this thesis unless otherwise noted. Table 4-4 summarizes direct non-labor costs for instruction.

b. Blocks 100-110: Direct Non-Labor Costs for Research

The DFR section of the Job Order Report tracks expenses related to research. However, the cost centers indicated do not correspond to line managers, as in the case

TABLE 4-4

OPERATING FUNDS (NPS), DIRECT NON-LABOR

Code	Acad. Group	Cost Cent.	Sub-Cost Cent.	Non-Travel	Travel	Blocks 89-99 Total
AA		07	HE	$104,187.16	$15,612.14	$119,799.30
AS		07	GD	47,555.93	5,747.55	
	CC	07	GL	6,033.27	1,302.68	60,639.00
CS		07	GB	144,846.57	1,575.52	146,422.09
EC		07	HC	143,404.36	7,174.60	
	SP	07	HJ	8,984.52	2,907.87	162,471.00
MA		07	GC	33,203.80	3,534.29	36,738.09
ME		07	HG	86,859.39	4,329.61	91,189.00
MR		07	HD	97,530.48	3,188.95	100,719.43
NS		07	GF	31,820.90	8,018.36	
	EN	07	GK	5,628.68	1,857.49	47,325.00
OC		07	HF	52,262.21	4,171.10	56,433.21
OR		07	GE	81,947.51	7,365.51	
	AW	07	GJ	7,932.03	1,115.86	
	OR	07	HH	7,558.95	65.85	105,986.00
PH		07	HB	51,010.11	712.12	51,722.23
Total						$979,444.35

NOTE: Sub-Cost centers GL, HJ, GK, and GJ are academic groups CC, SP, EW and AW, respectively. The cost of these academic groups were combined with their parent departments AS, EC, NS, and OR, respectively. Source document for this data is the Job Order Report.

of NPS funds. The cost centers are used to identify the research funds as either direct (12), indirect (ND) or chair (CR). In essence, all these categories are in direct support of research. Fortunately, the codes associated with sub-cost centers do identify the academic department responsible for the expenditure. Table 4-5 summarizes direct non-labor costs for research.

B. INDIRECT COSTS

1. Allocation of Indirect Costs

Background discussions for indirect costs were provided in Chapters II and III. Recall that we define indirect costs as those that relate to the mission areas of research and instruction, but that cannot be clearly assigned to individual academic departments. Thus, to allocate indirect labor and non-labor costs to the academic departments we sought a means to associate these costs with the relative effort devoted to research and instruction in each academic department. To do this we used the FY 90 man-year (MY) figures given in Exhibit 4-7. This data was obtained from the Director of Academic Planning at NPS and it provides a convenient breakdown by academic department of the total faculty effort devoted to both research and instruction as measured by man-years. To allocate indirect labor and non-labor costs to academic departments by research or instruction or both, we derived separate allocation multipliers for each

TABLE 4-5

DIRECT FUNDED RESEARCH (DFR), DIRECT NON-LABOR

Code	Acad. Group	Cost Cent.	Sub-Cost Cent.	Non-Travel	Travel	Blocks 100-110 Total
AA		12	UA	$264,409.80	$46,011.07	
		ND	UZ	12,302.10	3,707.92	326,430.89
AS		12	NA	71,025.81	51,506.34	
		ND	NZ	18,199.72	46,809.04	
	CC	ND	ZX	1,010.50	3,892.09	
		*CR	02		1,400.04	193,844.04
CS		12	LA	126,183.71	42,303.21	
			ND	50,624.60	10,960.10	
		*CR	01	96,039.00	3,462.71	329,573.33
EC		12	SA	255,281.41	46,364.55	
		ND	SZ	30,970.47	5,498.31	
	SP	12	YA	25,820.34	2,498.31	
	SP	ND	YZ	5,248.02	2,401.06	373,721.53
MA		12	MA	12,506.06	15,594.03	
		ND	MZ	5,354.32	8,871.57	42,325.98
ME		12	WA	276,603.87	44,001.63	
		ND	WZ	19,243.38	10,027.88	
		*CR	12	76,713.55	2,718.22	429,308.53
MR		12	TA	209,464.20	92,262.02	
		ND	TZ	59,949.32	997.96	
		*CR	08	77,052.00	1,781.33	441,506.83
NS		12	QA	32,387.11	17,040.21	
		ND	QZ	1,277.00	13,485.07	
	EW	12	ZA	91,537.78	12,514.22	
	EW	ND	ZY	350.00	866.16	
		*CR	15	1,551.67	7,800.03	178,809.25
OC		12	VA	247,728.47	36,328.47	
		ND	VZ	21,010.39	13,190.86	
		*CR	09	1,153.50	2,181.43	
		*CR	10	59,085.08	4,721.35	
		*CR	11	83,067.50	9,413,00	477,880.05
OR		12	PA	96,921.75	65,975.88	
		ND	PZ	36,198.37	13,607.17	
	AW	12	XA	2,692.32	0	
	AW	ND	XZ	8,546.18	0	
		*CR	05		1,909.11	225,850.78
PH		12	RA	305,567.20	57,797.56	
		ND	RZ	29,012.24	9,465.04	
		*CR	06	35,828.63		437,647.99
Total						$3,456,899.20

TABLE 4-5 (CONTINUED)

* Honorary chairs are individuals who are considered experts in their field, working on a short-term basis. Although chair costs are listed under the DFR section of the Job Order Report, some chairs do instruct. Consequently, chair cost may be overstated. They are therefore shown separately.

NOTE: Sub-cost center ZX, YA/YZ, ZA/ZY, XA/XZ are academic groups CC, SP, EW, and AW, respectively. The cost of these academic groups were combined with their parent departments AS, EC, NS and OR, respectively. Source document for this data is the Job Order Report.

of the 11 academic departments using man-years as the allocation base. This is discussed in greater detail below.

An allocation base is a scheme for dividing a given quantity, usually a total cost, among activities. The idea is that a fractional representation of some common attribute is used to "spread" the allocated quantity to all activities by multiplying each activity's fraction times the quantity. In this case the activities are the academic departments and the common attribute is man-years. The fractional representation (or multiplier) for each activity is made up of a numerator and denominator. The numerator is unique to each activity and represents the amount of the attribute applicable to that activity alone. In this case the numerator is the man-years assigned to a given academic department. The denominator is the sum of the attributes of all activities and in this case is represented by total man-years for all academic departments.

FY90 SUMMARY	QTR 1 10/1 to 12/31			QTR 2 1/1 to 3/31			QTR 3 4/1 to 6/30			QTR 4 7/1 to 9/30			TOTAL Man Years			
DEPARTMENT	DT1	DR1	RR1	DT2	DR2	RR2	DT3	DR3	RR3	DT4	DR4	RR4	DTY	DRY	RRY	TOTAL
01 ADMIN	1.73	0.02	0.00	1.50	0.00	0.00	1.50	0.00	0.00	1.49	0.00	0.00	6.22	0.02	0.00	6.24
52 CS	2.77	2.13	0.40	3.37	1.62	0.45	3.06	1.79	0.49	3.58	1.12	0.55	12.79	6.66	1.89	21.34
53 MATH	4.96	0.98	0.25	4.58	1.51	0.31	4.42	0.58	1.15	5.88	0.77	0.33	19.84	3.85	2.04	25.73
54 AS	8.23	2.63	1.03	9.95	1.55	1.15	7.41	3.00	2.13	8.97	2.55	1.98	34.56	9.72	6.29	50.57
55 OR	5.05	2.32	0.72	5.67	1.59	0.35	5.19	1.30	1.87	4.20	2.30	1.86	20.12	7.51	4.81	32.43
56 NSA	4.37	1.06	0.40	4.72	0.84	0.43	4.10	0.79	0.82	3.88	1.07	0.98	17.07	3.76	2.63	23.46
61 PHYS	4.16	2.21	0.63	4.09	2.24	0.79	4.09	1.70	1.12	3.44	2.11	1.31	15.75	8.25	3.84	27.85
62 ECE	5.06	3.39	0.91	6.16	2.90	0.95	5.69	2.71	1.06	5.54	3.40	0.90	22.44	12.40	3.81	38.65
63 METEOR	1.37	1.86	0.77	1.79	1.77	0.44	1.82	1.82	0.52	1.79	1.96	0.45	6.75	7.42	2.18	16.35
67 AERO	3.19	1.61	0.16	3.51	1.60	0.16	2.74	2.02	0.72	2.74	2.20	0.63	12.18	7.43	1.68	21.28
68 OCEAN	2.57	2.37	0.14	2.01	2.69	0.24	2.17	2.37	0.28	1.74	2.80	0.17	8.49	10.25	0.84	19.59
69 ME	3.32	2.66	0.23	4.20	1.99	0.77	2.95	2.55	1.00	4.01	2.07	0.71	14.48	9.28	2.70	26.46
034 AV SAF	0.54	0.00	0.00	0.54	0.00	0.00	0.54	0.00	0.00	0.53	0.00	0.00	2.14	0.00	0.00	2.14
TOTALS	47.31	23.25	5.64	52.09	20.30	6.03	45.67	20.63	11.18	47.79	22.35	9.86	192.85	86.54	32.71	312.10
DIRECT TOT	76.56			78.38			66.31			70.14			279.39			
CUM TOTAL	76.20			78.41			77.49			80.00			LS/IPA 4.00			
CUM COMB TOT	76.20			154.61			232.10			312.10			T 283.39			316.10

DTY = "Direct Teach (year)" and represents the total time spent in Instruction.

DRY = "Direct Research (year)" and represents the total time spent on direct funded research.

RRY = "Reimbursable Research (year)" and represents the total time spent on reimbursable research.

Exhibit 4-7 FY90 Man-Year Data by Academic Department

In light of the school's primary mission areas, allocated indirect costs may be grouped into three categories. First, some allocated costs are applicable to both research and instruction for each academic department. Second, other costs are related to only research. Finally, some costs are related to instruction only. Thus, we derived three sets of allocation multipliers and discuss the development of each set below. The identification and discussion of specific indirect costs and the manner in which they are allocated are addressed in the next section.

To allocate indirect costs to both research and instruction we summed the total MY for the academic departments to determine the denominator of the allocation base. Numerators for each academic department were obtained from the total Direct Teach (DTY) and Direct and Reimbursable Research (DRY + RRY) columns for instruction and research respectively in Exhibit 4-7. For example, the multipliers for the Administrative Sciences (AS) department were calculated as follows:

Total FY 90 Academic Departments Man Years

Instruction (Total DTY Column) =	184.47
Research (Total DRY + RRY Columns) =	119.24
Total Academic Department MY	303.71

Total AS Instruction MY (DTY_{AS}) = 34.56

Total AS Research MY = (DRY_{AS} + (RRY_{AS}) = 9.72 + 6.29 = 16.01

AS Indirect Allocation Multipliers
for both Instruction and Research

INSTRUCTION

$$\frac{\text{Total AS Instruction MY}}{\text{Total MY}} = \frac{34.56}{303.71} = .1138$$

RESEARCH

$$\frac{\text{Total AS Research MY}}{\text{Total MY}} = \frac{16.01}{303.71} = .0527$$

Multipliers for the remaining academic departments were similarly calculated and are summarized in Table 4-6.

Instruction only multipliers were derived by substituting Total Instruction Man-Years for Total Man-Years in the denominator. For example, the AS instruction only multiplier was calculated as follows:

$$\frac{\text{AS Instruction MY } (DTY_{AS})}{\text{Total Instruction MY (DTY)}} = \frac{34.56}{184.47} = .1874$$

Similarly, research only multipliers were derived by substituting Total Research Man-Years in the denominator. Again, in the case of the AS department the research only multiplier was calculated as follows:

$$\frac{\text{Total AS Research MY } (DRY_{AS} + RRY_{AS})}{\text{Total Research MY (DRY + RRY)}} = \frac{16.01}{119.24} = .1343$$

Multipliers for allocation of indirect costs to Instruction and Research individually are summarized in Tables 4-7 and 4-8 respectively.

TABLE 4-6

INDIRECT COST ALLOCATION MULTIPLIERS FOR BOTH INSTRUCTION AND RESEARCH USING MAN YEAR DATA FROM EXHIBIT 4-5

	Instruction		Research	
Dept	Dept Instruction Manyears / Total Manyears		Dept Research Manyears / Total Manyears	
AA	12.18/303.71 =	.0401	9.11/303.71 =	.0300
AS	34.56/303.71 =	.1138	16.01/303.71 =	.0527
CS	12.79/303.71 =	.0421	8.55/303.71 =	.0282
EC	22.44/303.71 =	.0739	16.21/303.71 =	.0534
MA	19.84/303.71 =	.0653	5.89/303.71 =	.0194
ME	14.48/303.71 =	.0477	11.98/303.71 =	.0394
MR	6.75/303.71 =	.0222	9.6/303.71 =	.0316
NS	17.07/303.71 =	.0562	6.39/303.71 =	.0210
OC	8.49/303.71 =	.0280	11.09/303.71 =	.0365
OR	20.12/303.71 =	.0662	12.32/303.71 =	.0406
PH	15.75/303.71 =	.0519	12.09/303.71 =	.0398
		.6074		.3926

TABLE 4-7

INDIRECT COST ALLOCATION MULTIPLIERS FOR INSTRUCTION ONLY

Dept	Dept Instruction Manyears / Total Instruction Manyears	
AA	12.18/184.47 =	.0660
AS	34.56/184.47 =	.1874
CS	12.79/184.47 =	.0693
EC	22.44/184.47 =	.1216
MA	19.84/184.47 =	.1076
ME	14.48/184.47 =	.0785
MR	6.75/184.47 =	.0366
NS	17.07/184.47 =	.0925
OC	8.49/184.47 =	.0460
OR	20.12/184.47 =	.1091
PH	15.75/184.47 =	.0854
		1.0000

TABLE 4-8

INDIRECT COST ALLOCATION MULTIPLIERS FOR RESEARCH ONLY

Dept	Dept Research Manyears / Total Research Manyears
AA	9.11/119.24 = .0764
AS	16.01/119.24 = .1343
CS	8.55/119.24 = .0717
EC	16.21/119.24 = .1359
MA	5.89/119.24 = .0494
ME	11.98/119.24 = .1005
MR	9.60/119.24 = .0805
NS	6.39/119.24 = .0536
OC	11.09/119.24 = .0930
OR	12.32/119.24 = .1033
PH	12.09/119.24 = .1014
	1.0000

2. Indirect Labor Costs

Indirect labor costs are those costs associated with NPS line manager codes previously identified in Chapter III as having an indirect supporting role in the production of graduates. Recall that these codes are 01, 03, 06, 07 (Dean's Staff and Academic groups), and 08. In this section we identify the civilian and military labor costs associated with those codes.

Primary source documents for determining civilian staff costs are included as Exhibits 4-1, 4-2 and 4-8. As was the case with direct labor, these exhibits do not include fringe benefit costs. We should note here that Exhibit 4-1

FY-91 MISSION STAFF BUDGET PLAN/EXECUTION

	QTR 1			QTR 2			QTR 3			QTR 4			TOTALS				
	OT1	DR1	RM1	OT2	DR2	RM2	OT3	DR3	RM3	OT4	DR4	RM4	OTT	DRT	DIR TO	RMT	TOTAL
01	40166	0	0	41450	0	0	42097	0	0	42745	0	0	166458	0	166458	0	166458
03	177437	0	0	188348	0	0	191935	0	0	194887	0	0	752607	0	752607	0	752607
05	467535	0	0	499910	0	251	520801	0	0	531761	0	0	2020007	0	2020007	251	2020258
06	54866	0	0	66984	0	0	66876	0	0	67905	0	0	256631	0	256631	0	256631
07	806241	262632	121167	788082	235698	196951	759535	196975	280104	787726	180869	289578	3141584	876174	4017708	887800	4905507
08	44576	0	0	50343	0	0	55645	0	0	56488	0	0	207051	0	207051	0	207051
TOTALS	1590821	262632	121167	1635117	235698	197202	1636888	196975	280104	1681512	180869	289578	6544338	876174	7420462	888051	8308513
DIR TOT	1853453			1870814			1833863			1862381							
COMB TOT	1974620			2068017			2113967			2151959							

OTT = "Other" and represents that portion of labor related to Instruction.

DRT = "Direct Research" and represents that portion of labor related to NPS funded research.

RMT = "Reimbursable Research" and represents that portion of labor related to Reimbursable Research.

Note: Figures are in dollars and do not include fringe benefit costs of 22.5%.

Exhibit 4-8 FY91 Mission Staff Salary Data by Line Manager Codes

contains a salary grouping indicated as "Admin." This is a collection of key supervisory personnel salaries such as the Provost, Head Librarian, Assistant Dean for Research Admin, and the Head of the Computer Center. It would have been best to disaggregate this figure and include these individual salaries with their appropriate line manager codes. We elected not to do this, however, to preclude investigation and publication of individual salaries as this seemed to be a somewhat sensitive issue. We therefore chose to allocate the "Admin" salaries as an indirect civilian labor cost applicable to both research and instruction and do not believe this will cause distortion since the amount is relatively small. These costs are identified in paragraph (f) below.

a. LM 01: Office of the Provost

Annual civilian staff costs from Exhibit 4-8:

$166,458
X 1.225 fringe
$203,911

This cost will be allocated to both Instruction and Research using the multipliers in Table 4-6. There are no military personnel assigned to Code 01.

b. LM 03: Director of Programs

(1) Annual Civilian Staff Costs from Exhibit 4-8.

$752,607
X 1.225 fringe
$921,944

(2) Annual Military Staff Costs. Military personnel assigned to Code 03 were determined by referencing a current staff roster. Military staff costs were then derived by applying appropriate annual composite pay rates. The results are summarized below in Table 4-9. Civilian and military staff costs for Code 03 will be allocated to both research and instruction via the Table 4-6 multipliers.

TABLE 4-9

CODE 03 MILITARY STAFF LABOR COSTS

# X Paygrade (Service)	X	Annual Composite Pay Rate	=	Total
4 X 06 (USN)		$109,474	=	$437,896
1 X 06 (USA)		111,993	=	111,993
9 X 05 (USN)		92,824	=	835,416
1 X 05 (USMC)		90,280	=	90,280
1 X 05 (USAF)		91,916	=	91,916
3 X 04 (USN)		78,720	=	236,160
4 X 03 (USN)		67,045	=	268,180
1 X E7 (USN)		44,693	=	44,693
1 X E3 (USMC)		21,600	=	21,600
		Total	=	$1,869,974

c. LM 06: Dean of Instruction

Annual civilian staff costs from Exhibit 4-8:

$256,631
X 1.225 fringe
$314,373

Since these staff costs are not related to research, they will be allocated to academic departments for instruction only using the multipliers in Table 4-7. There are no military personnel assigned to Code 06.

d. LM 07: Dean of Faculty and Graduate Studies

Exhibit 4-2 provides a comprehensive breakdown of costs associated with Code 07. Recall that the civilian labor costs of secretarial personnel and lab technicians for each academic department were previously extracted as direct costs. Thus, only the staff costs of the Dean's immediate office and the clerical personnel supporting the academic groups need to be allocated since there is no breakdown of these costs by academic department.

(1) Annual Dean's Staff Costs from Exhibit 4-2.

$43,444
X 1.225 fringe
$53,219

These costs have no research component and will be allocated to Instruction only using the Table 4-7 multipliers.

(2) Annual Cost for Clerical Personnel in the Academic Groups from Exhibit 4-2.

Instruction	Research
$55,445	$154,251
X 1.225 fringe	X 1.225 fringe
$67,920	$188,957

Since the costs of clerical personnel can be separated into research and instruction components, each will be allocated by the research only or instruction only multipliers of Tables 4-8 and 4-7, respectively. There are no military personnel assigned to Code 07.

e. LM 08: Dean of Research

Annual civilian staff costs from Exhibit 4-8:

$207,051
X 1.225 fringe
$253,637

Since these staff costs are not related to instruction, they will be allocated to academic departments for research only using the multipliers in Table 4-8. There are no military staff assigned to Code 08.

f. "Admin": Salaries of Selected Key Individuals

Annual "Admin" staff costs from Exhibit 4-1:

$436,128
X 1.225 fringe
$534,257

"Admin" costs will be allocated to both instruction and research using the multipliers in Table 4-6.

3. Indirect Labor Cost Allocations

The previous sections accumulated the various components of indirect labor by staff codes. We now discuss the specific allocations of these costs and describe the aggregation of matrix blocks 23-44 and 67-88.

a. Blocks 23-44: Civilian Indirect Labor Costs

Matrix blocks 23-44 are composed of three parts. First, recall that the civilian labor of line managers 01 and "Admin" must be allocated to both instruction and research for each academic department. The summation of these costs is as follows:

Code	Total Civilian Labor Cost	From Paragraph
01	$203,911	B2a
"Admin"	$534,257	B2f
	$738,168	

The figure $738,168 is allocated using the Table 4-6 multipliers.

Second, the labor costs of LM 06, the instruction component of academic group clerical costs, the costs of the Dean's office from Code 07, and the civilian labor costs from LM 03 are allocated to instruction only via the Table 4-7 multipliers. These costs are aggregated below.

LM	Total Labor	From Paragraph
06	$314,373	B2c
Academic Groups (Instruction)	67,920	B2d2
03	921,944	B2b1
07 (Dean's Office)	53,219	2d1
	$1,357,456	

Finally, Code 08 labor costs and the research component of academic group clerical costs are allocated to

research only using the Table 4-8 multipliers. These costs are aggregated below.

Code	Total Labor	Paragraph
08	253,637	B2e
Academic Groups (Research)	188,957	B2d2
	$442,594	

Table 4-10 summarizes the allocation and aggregation of indirect civilian labor costs into matrix blocks 23-44.

b. Blocks 67-88: Military Indirect Labor

Of the line managers identified as indirect, only LM 03 has military personnel assigned. Since LM 03 costs have been identified as having an indirect impact on instruction only, the total military indirect labor for instruction is $1,869,974 as computed in Table 4-9. The allocation of these costs using the Table 4-7 multipliers is summarized in Table 4-11. Note that since LM 03 costs are for instruction only, there are no military indirect labor costs for research. Thus matrix blocks 78-88 equal zero.

4. Indirect Non-labor Costs for Instruction and Research (Blocks 111-132)

Recall that indirect costs are those costs that benefit the various academic departments, but not the entire school, and that the non-labor costs of the following line managers are considered indirect: Provost (01), Director of Students and Programs (03), Dean of Faculty and Graduate

TABLE 4-10

ALLOCATION OF INDIRECT LABOR COSTS AND AGGREGATION OF MATRIX BLOCKS 23-44

Instruction

Dept	Allocation of 01 and "Admin" Via Table 4-6 Multipliers	+	Allocation of 06, 07 (Dean's Office) and Academic Groups Via Table 4-7 Multipliers	Matrix Blocks 23-33
AA	.0401 X 738,168 = $29,601		.066 X 1,357,456 = $89,592	$119,193
AS	.1133 X 738,168 = 83,634		.1874 X 1,357,456 = 254,387	338,021
CS	.0421 X 738,168 = 31,077		.0693 X 1,357,456 = 94,072	125,149
EC	.0739 X 738,168 = 54,551		.1216 X 1,357,456 = 165,067	219,618
MA	.0653 X 738,168 = 48,202		.1076 X 1,357,456 = 146,062	194,264
ME	.0477 X 738,168 = 35,211		.0785 X 1,357,456 = 106,560	141,771
MR	.0222 X 738,168 = 16,387		.0366 X 1,357,456 = 49,683	66,070
NS	.0562 X 738,168 = 41,485		.0925 X 1,357,456 = 125,565	167,050
OC	.0280 X 738,168 = 20,669		.0460 X 1,357,456 = 62,443	83,112
OR	.0662 X 738,168 = 48,867		.1091 X 1,357,456 = 148,098	196,965
PH	.0519 X 738,168 = 38,311		.0854 X 1,357,456 = 115,927	154,238

Research

Dept	Continued Allocation of 01, 03, and "Admin" Via Table 4-6 Multipliers	+	Allocation of 08 and Academic Groups Via Table 4-8 Multipliers	Matrix Blocks 34-44
AA	.0300 X 738,168 = $22,145		.0764 X 442,594 = $33,814	$55,959
AS	.0527 X 738,168 = 38,901		.1343 X 442,594 = 59,440	98,341
CS	.0282 X 738,168 = 20,816		.0717 X 442,594 = 31,734	52,550
EC	.0534 X 738,168 = 39,418		.1359 X 442,594 = 60,149	99,567
MA	.0194 X 738,168 = 14,320		.0494 X 442,594 = 21,864	36,184
ME	.0394 X 738,168 = 29,084		.1005 X 442,594 = 44,481	73,565
MR	.0316 X 738,168 = 23,326		.0825 X 442,594 = 35,629	58,955
NS	.0210 X 738,168 = 15,502		.0536 X 442,594 = 23,723	39,225
OC	.0365 X 738,168 = 26,943		.0930 X 442,594 = 41,161	68,104
OR	.0406 X 738,168 = 29,970		.1033 X 442,594 = 45,720	75,690
PH	.0398 X 738,168 = 29,379		.1014 X 442,594 = 44,879	74,258

TABLE 4-11

ALLOCATED MILITARY INDIRECT LABOR FOR RESEARCH INSTRUCTION BY ACADEMIC DEPARTMENT

Dept	Instruction			Matrix Blocks 67-77
AA	.066	X $1,869,974	=	$123,418
AS	.1874	X 1,869,974	=	350,433
CS	.0693	X 1,869,974	=	129,589
EC	.1216	X 1,869,974	=	227,389
MA	.1076	X 1,869,974	=	201,209
ME	.0785	X 1,869,974	=	146,793
MR	.0366	X 1,869,974	=	68,441
NS	.0925	X 1,869,974	=	172,973
OC	.0460	X 1,869,974	=	86,019
OR	.1091	X 1,869,974	=	204,014
PH	.0854	X 1,869,974	=	159,696

Studies (07), and Dean of Instruction (06) and Dean of Research (08). The entire non-labor cost of 01 are allocated to the academic departments by the man-years data provided in Exhibit 4-7. Fiscal 90 data did not reflect the new organizational structure created in FY 91, which instituted the offices of the Dean of Research (October 1, 1990) and Dean of Instruction (06). Consequently, no costs for line manager 06 were reported in the FY 90 data. We mention this so that future analysts will include the non-labor costs of code 06 and allocate these costs to instruction only using the Table 4-7 multipliers.

The only cost of line manager 07 (faculty and graduate studies) that were indirectly allocated to the academic departments were those costs that could not be directly traced to a particular academic department in the Job Order Report. For ease of computation, the totals of line managers 01 and 07 (applicable portion) were combined prior to allocation to academic departments for both instruction and research.

The cost of line manager 03 (Director of Students and Programs) support instruction and not research, and were consequently allocated to academic departments for instruction only. Computationally, this was carried out after the allocation of costs for line managers 01 and 07 were completed. The allocated portion of line manager 03 was then added to the instruction totals of each academic department.

The costs of line manager 08 (Dean of Research) support research and not instruction, and thus were allocated to academic departments for research only. Computationally, this was carried out after the allocation of costs for line managers 01 and 07 were completed. The allocated portion of line manager 08 was then added to the research totals of each academic department. The new organizational structure that created a Dean of Research and a Dean of Instruction did not take effect until October 1, 1990, but we attempted to include these line managers in our framework. Since we were using FY 90 data, we had to make several assumptions concerning certain sub-cost centers to reflect the new organizational

structure, that is, some sub-cost centers were reassigned to different line managers (see note to Table 4-14).

An example of how the allocation process described above was carried out in determining the amount of indirect cost to be allocated to a particular academic department, in this case, the Aeronautics and Astronautics Department (AA), is shown below.

Table 4-12 aggregates the total non-labor cost associated for each line manager, with the exception of 07, from the job order report. The total listed for 07 excludes those amounts directly traceable to a particular academic department, thus the amount listed for 07 only includes the amount that should be allocated as indirect cost. Summation of total costs of line managers 01 ($168,389), and 07 ($67,294), yields the total amount to be allocated to instruction and research by academic department. This equals $235,684. The amount of indirect cost that should be allocated to research and instruction for each academic department is determined by using the allocation scheme presented in paragraph B1. An example of computations for allocation of line managers 01 and 07 cost for academic department AA is shown below.

TABLE 4-12

OPERATING FUNDS (NPS), INDIRECT NON-LABOR ALLOCABLE TO INSTRUCTION AND RESEARCH

Cost Center	Sub-Cost Center	Non-Travel	Travel	Total
01	BA	$10,160.50	$6,226.95	
	BP	140,403.46	11,598.28	$168,389.19
*07	GA	513.43	4,548.39	
	HA	51,321.91	8,910.73	
	HP	1,800.00	200.00	67,294.46
Total				$235,683.65

*Excludes amounts directly traceable to academic departments.

Note: Source document for these data is the Job Order Report.

Amount Allocated to Instruction for AA Department:

Table 4-6 Multiplier X Total Indirect Cost + Allocated portion of line Mgr 03

$$= \frac{DTY_{AA}}{\text{Total MY's}} \times \text{Total Indirect Cost} + \text{Allocated portion of line Mgr 03}$$

= .0401 X $235,684 + Allocated portion of line Mgr 03

= $9,451 + Allocated portion of line Mgr 03.

Note that the first term in the equation represents the AA Instruction multiplier from Table 4-6. Recall that DTY_{AA} represents the "Direct Teach Total" man-years for academic department AA in Exhibit 4-7.

To allocate the cost of line manager 03, use the total non-labor Operating Funds (NPS) shown in Table 4-13

($3,491,524). Allocation to a specific academic department is facilitated using the instruction only multipliers in Table 4-7. The example of academic department AA continues below.

TABLE 4-13

OPERATING FUNDS (NPS); INDIRECT NON-LABOR ALLOCABLE TO INSTRUCTION

Cost Center	Sub-Cost Center	Non-Travel	Travel	Total
03	DA	$30,993.51	$13,759.99	
	DB	2,000,891.58	5,393.81	
	DC	16,540.63	11,157.22	
	DD	180,030.51	457.08	
	DE	215,682.89	0.00	
	DF	3,739.33	2,217.71	
	DG	1,967.87	7,767.41	
	DH	340.57	1,724.00	
	DJ	3,960.35	5,954.22	
	DK	4,745.69	6,624.32	
	DL	4,222.93	4,765.63	
	DM	3,043.49	461.22	
	DN	8,255.22	19,544.80	
	DP	1,890.88	4,097.16	
	DQ	9,429.71	8,261.69	
	DR	4,988.86	0.00	
	DS	201,706.50	0.00	
	DT	1,687.24	0.00	
	DU	586,918.61	0.00	
	DV	93,000.00	0.00	
	DX	0.00	$25,283.11	$3,491,523.70

Allocation of Line Manager 03's Instruction Cost to AA Department:

Table 4-7 Multiplier X Non-labor Cost of line Mgr 03:

$$= \frac{(DTY)_{AA}}{\text{Total Instruction MY's}} \text{ X Non-labor Cost of line Mgr 03}$$

$$= .0660 \text{ X } \$3,491,524 = \$230,441$$

Thus, total non-labor indirect cost allocated to instruction for Department AA is $9,451 + $230,441 = $239,892. Table 4-15 summarizes the allocation and aggregation of indirect non-labor costs into matrix blocks 111-121.

Amount Allocated to Research for AA Department

Table 4-6 Multiplier X Total Indirect Cost + Allocated portion of line Mgr 08

$$= \frac{(DRY + RRY)_{AA}}{\text{Total MY}} \text{ X Total Indirect Cost + Allocated portion of line Mgr 08}$$

$$= .0300 \text{ X } \$235,684 + \text{Allocated portion of line Mgr 08}$$

$$= \$7,071 + \text{Allocated portion of line Mgr 08.}$$

Recall that DRY and RRY represent Direct and Reimbursable man-years respectively from Exhibit 4-7.

To allocate the cost of line manager 08, the total to be allocated must be obtained by combining the amount of NPS and DFR funds for 08 from Table 4-14 below. The total is: $71,014 + $416,648 = $487,662. Allocation to a specific academic department is facilitated using the research only multipliers in Table 4-8. The example of academic department AA continues below.

TABLE 4-14

OPERATING FUNDS (NPS)/DIRECT FUNDED RESEARCH;
INDIRECT NON-LABOR ALLOCABLE TO RESEARCH

Sec.	Code	Cost Center	Sub-Cost Center	Non-Travel	Travel	Total
NPS	08	08	GN	$71,014		$71,014
DFR	*81	ND	ZW	115,650	$10,998	126,648
DRF	*81	12	ZZ	290,000		290,000
	Total					$487,662

*The costs of this code 81 (Director of Research Admin) fall under line manager 08 since they are directly related to research.

Note: Sub-Cost Center GN belonged to line manager 07 in FY90 records, but was realigned to line manager 08 in FY91 to reflect new organizational structure. It is now sub-cost center MB, and the costs associated with this sub-cost center have been assigned to line manager 08 since the expenditures were related to research. Source document for this data is the Job Order Report.

Allocation of Line Manager 08's Research Cost to AA Dept.:

Table 4-8 Multiplier X Non-labor Cost of line Mgr 08

$$= \frac{(DRY + RRY)_{AA}}{\text{Total Research MY's}} \text{ X Non-labor Cost of line Mgr 08}$$

= .0764 X $487,662 = $37,257

Thus, total non-labor indirect cost allocated to research for department AA is $7,071 + $37,257 = $44,328. Table 4-15 summarizes the allocation and aggregation of indirect non-labor costs into matrix blocks 122-132.

TABLE 4-15

ALLOCATION OF INDIRECT NON-LABOR COSTS AND
AGGREGATION OF MATRIX BLOCKS 111-132

Instruction

Dept	Allocation of line Mgr 01, 07	+	Allocation of line Mgr 03	=	Matrix Blocks 111-121
AA	.0401 X 235,684 = $9,451		.0660 X 3,491,524 = $230,441		239,892
AS	.1138 X 235,684 = 26,821		.1874 X 3,491,524 = 654,311		681,132
CS	.0421 X 235,684 = 9,922		.0693 X 3,491,524 = 241,963		251,885
EC	.0739 X 235,684 = 17,417		.1216 X 3,491,524 = 424,569		441,986
MA	.0653 X 235,684 = 15,390		.1076 X 3,491,524 = 375,688		391,078
ME	.0477 X 235,684 = 11,242		.0785 X 3,491,524 = 274,085		285,327
MR	.0222 X 235,684 = 5,232		.0366 X 3,491,524 = 127,790		133,022
NS	.0562 X 235,684 = 13,245		.0925 X 3,491,524 = 322,966		336,211
OC	.0280 X 235,684 = 6,599		.0460 X 3,491,524 = 160,610		167,209
OR	.0662 X 235,684 = 15,602		.1091 X 3,491,524 = 380,925		396,527
PH	.0519 X 235,684 = 12,232		.0854 X 3,491,524 = 298,176		310,408
Total					$3,634,677

Research

Dept	Allocation of line Mgr 01, 07	+	Allocation of line Mgr 08	=	Matrix Blocks 122-132
AA	.0300 X 235,684 = $7,071		.0764 X 487,662 = $37,257		44,328
AS	.0527 X 235,684 = 12,421		.1343 X 487,662 = 65,493		77,914
CS	.0282 X 235,684 = 6,646		.0717 X 487,662 = 34,965		41,611
EC	.0534 X 235,684 = 12,586		.1359 X 487,662 = 66,273		78,859
MA	.0194 X 235,684 = 4,572		.0494 X 487,662 = 24,091		28,663
ME	.0394 X 235,684 = 9,286		.1005 X 487,662 = 49,010		58,296
MR	.0316 X 235,684 = 7,448		.0805 X 487,662 = 39,257		46,705
NS	.0210 X 235,684 = 4,949		.0536 X 487,662 = 26,139		31,088
OC	.0365 X 235,684 = 8,603		.0930 X 487,662 = 45,353		53,956
OR	.0406 X 235,684 = 9,569		.1033 X 487,662 = 50,375		59,944
PH	.0398 X 235,684 = 9,380		.1014 X 487,662 = 49,449		58,829
Total					$580,193
Total Indirect Non-labor Costs					$4,214,870

C. G&A COSTS (Blocks 133-155)

As defined in Chapter II, G&A costs includes those costs which are incurred for the benefit of all outputs. Several points need to be made prior to discussing how G&A expenses were allocated: (1) what costs should be included in the amount to allocate, (2) which activities should be allocated as G&A expenses, and (3) what basis of allocation should be used.

The decision on what costs should be included in the total amount of G&A expenses to be allocated and how those costs would be collected was motivated by two factors. First, we decided that the cost of line managers 00, 05 and 04 would be considered G&A expenses, as justified in Chapter III. Unfortunately, there were no existing accounting records that collected cost for all the expenses incurred by these line managers. This leads to the second driving factor regarding what costs should be included in the G&A expense pool, namely, what presently available financial accounting records would facilitate the aggregation of G&A expenses. The present financial accounting system was not intended to support the idea of unit costing, and therefore we extrapolated unit cost information from those financial accounting sources that seemed most appropriate in terms of logical relationship and ease of use.

1. The Components of G&A Costs

After careful evaluation of the existing accounting information, we decided that the G&A cost pool should consist of three components: (1) non-labor expenses, (2) Base Operating Support (BOS) and Maintenance of Real Property (MRP), and (3) other salaries. These particular components were chosen because they constituted a format which enabled the aggregation of G&A cost. The reports used sometimes overlapped by accounting for the same expenses. This made it necessary to remove certain expenses in one of the components to avoid double counting. The three components are described below.

The first component of the G&A pool, the non-labor expenses for line managers 00, 04 and 05 were readily available in the Job Order Report. The total non-labor expenses for each of the line managers is shown in Table 4-16, excluding base operating expenses (BOS). BOS expenses were excluded because they are aggregated in another report which does not breakdown cost by line manager. This report will be used in the aggregate as part of the second component of the G&A pool. Consequently, if BOS expenses were not removed from the non-labor cost for line managers 00, 04 and 05, they would be double counted. As it ends up, all of line manager's 04 non-labor costs are in support of base operations, with the exception of the Public Affairs Office. The Public Affairs Office receives its own funding separate from the Naval

TABLE 4-16

COMPONENT 1 OF G&A POOL FROM NPS FUNDS

Cost Center	Sub-Cost Center	Non-Travel	Travel	Total
00	AA	$8,272.13	$25,269.75	
00	AN	1,758.57	2,740.26	
00	AQ	9,560.63		
00	AL	2,362.00	722.58	50,685.92
*04	UC	23,031,89	5,997.62	29,029.51
05	CA	34,620.77	6,327.90	
05	CB	665,723.86	16,933.81	
05	CC	818,948.57	6,045.21	
05	CD	357.00		
05	CE	36,146.72	855.46	1,585,959.30
Total Component I				$1,665,674.73

* Expenses shown for Sub-Cost Center 36 are for the Public Affairs Office; these figures can be found in the PA section of the Job Order Report.

Note: Excludes Sub-Cost Centers related to base operating support (BOS). Source document for data taken from Job Order Report.

Postgraduate School, as indicated earlier in the discussion of direct cost. However, for unit costing purposes, the expenses of the Public Affairs Offices have been included in the G&A pool as part of the first component.

The Naval Postgraduate School is funded by appropriated money from Congress by Activity Groups (AG's) which are further sub-divided into sub-activity groups (SAG's). These activity groups establish what the money should be spent for

(i.e., its purpose), in general terms. For NPS the three activity groups include: M-8 (Mission money), F-3 (Base Operations money), and F-4 (Maintenance of Real Property money). The SAG's further define the purpose of the appropriated money. For instance, one of the sub-activity groups (SAG's) that falls under the activity group (AG), BOS, is the SAG FAC (utilities). Note, in Exhibit 4-9, all SAG's under BOS and MRP begin with the letter F, making those costs easily identifiable in the Job Order Report.

Fortunately, excluding the portion of non-labor costs associated with BOS is easily accomplished. Recall that the Job Order Report tracks expenses by sub-cost centers. Additionally, it classifies expenditures according to sub-activity groups (SAG's), which identifies those expenditures related to BOS. The first component equals $1,636,645 as identified in Table 4-16.

The second component of the G&A expense pool are those costs incurred in support of base operations (BOS) and maintenance of real property (MRP). The totals for BOS and MRP can be found in Exhibit 4-9, FY90 CLOSE OUT TOTALS, by adding all the total direct costs for sub-activity groups (SAG's) that begin with the letter F (FC, FD, FF, FG, FJ, FK, FL, FN, FR, FT, FV, FA/MI, FB/R1, FA/M2, FB/R2). It should be noted that the totals by SAG's beginning with F includes both labor and materials costs. Fringe benefits are included in the labor amounts. The total for all SAG's beginning with F,

FY 1990 CLOSE OUT TOTALS $(000) DIRECT
NAVPGSCOL - 62271

--FINAL--	MISSION MZ	UTILITIES FC	FIRE/ ENG SUPP FD	ADMIN FF	SUPPLY FG	BACHELOR HOUSING FJ	EEO/ FAM SVCE FK	MWR FL	TELEPHONE FN	TRANS FR	HAZ WASTE FT	SECURITY FV	REPAIR REAL PROP FA/M1	MINOR CONST FB/M1	SPEC PROJ FA/M2	SPEC PROJ FB/M2	DIRECT TOTALS			EXPENSE % OF O&M,N	% OF TOTAL
E TRAVEL	1011			23	2		1	1		3	2						1043	E	TRAVEL	.02	
L TRANSPORTATION	153		114	7													293	L	TRANSPORTATION	.01	
M UTILITIES	5	1278					1						2				1286	M	UTILITIES	.02	
N COMMUNICATIONS									636								635	N	COMMUNICATIONS	.01	
P EQUIPMENT MAINT	798		17	8	14												837	P	EQUIPMENT MAINT	.02	
Q PURCH SERVICES	4830		1174	9	2	48	227	438		28	14	1	914	131	2408	558	10754	Q	PURCH SERVICES	.21	
R AIRCRAFT POL																	2	R	AIRCRAFT POL	.00	
T SUPPLIES	1428	22	63	38	7	3	57		24	69		5	639	64			2417	T	SUPPLIES	.05	
U LABOR	24974	164	1177	1359	1186		113	33	63	111		452	2125	36			32393	U	LABOR	.62	
V POL		5	1							24			3				33	V	POL	.00	
W EQUIPMENT	2152		46	17	1	2	34			1		1	84				2345	W	EQUIPMENT	.05	
Y PRINTING	31		4														35	Y	PRINTING	.00	
TOTAL DIRECT	35388	1469	2602	2253	1212	60	413	472	723	208	16	459	3767	231	2408	558	52259				.71
OP-32	35093	1546	2704	2038	1189	58	412	476	729	183	17	476	3914	307	2269	684	52115				
UNDER/OVER	295	-77	-102	-35	23	30	3	-4	-6	45	-1	-17	-147	-76	139	-126	-56				
SAG % OF DIRECT	.68	.03	.05	.04	.02	.00	.01	.01	.01	.00	.00	.01	.07	.00	.05	.01					

FMT

	MZ	FC	FD	FF	FG	FJ	FK	FL	FN	FR	FT	FV	FA/M1	FB/M1	FMT TOTALS			EXPENSE % OF FMT	
E TRAVEL	8			56											64	E	TRAVEL	.01	
L TRANSPORTATION			13												13	L	TRANSPORTATION	.00	
M UTILITIES			6												6	M	UTILITIES	.00	
N COMMUNICATIONS																N	COMMUNICATIONS	.00	
P EQUIPMENT MAINT				19											19	P	EQUIPMENT MAINT	.00	
Q PURCH SERVICES	47		298	61	1	60		150		19	10				645	Q	PURCH SERVICES	.14	
R AIRCRAFT POL																R	AIRCRAFT POL	.00	
T SUPPLIES	15		6	358	11							5			387	T	SUPPLIES	.08	
U LABOR	3053		14	96	14							31			3228	U	LABOR	.72	
V POL															8	V	POL	.00	
W EQUIPMENT	197		28	23	4							5			257	W	EQUIPMENT	.06	
Y PRINTING			5																
TOTAL FMT	3320		370	625	30	60		150		19	10	41			4628				.06
SAG % OF FMT	.72		.03	.13	.01	.01		.03		.00	.00	.01							

Exhbit 4-9. Fiscal Year 1990 Close Out Totals. Figures in

REIMBURSABLE

		MI	FC	FD	FF	FG	FJ	FK	FL	FN	FR	FT	FV	FA/M1	FB/M1	FA/M2	FB/M2	REIMB TOTALS			EXPENSE % OF REIMB
E	TRAVEL	1055		3										3				1061	E	TRAVEL	.06
L	TRANSPORTATION	26		23														49	L	TRANSPORTATION	.00
M	UTILITIES	5	2454	58							4			51				2572	M	UTILITIES	.16
N	COMMUNICATIONS			40						375				1				416	N	COMMUNICATIONS	.03
P	EQUIPMENT MAINT	51		231						2								284	P	EQUIPMENT MAINT	.02
Q	PURCH SERVICES	1266		1134	1				13	4	1			596				2865	Q	PURCH SERVICES	.18
R	AIRCRAFT POL																	0	R	AIRCRAFT POL	.00
T	SUPPLIES	373		189	24					10	2			257				860	T	SUPPLIES	.05
U	LABOR	4650		487	46	37		12					139	627				5887	U	LABOR	.36
V	POL			7							2			35				44	V	POL	.00
W	EQUIPMENT	1933		138	2					12								2085	W	EQUIPMENT	.13
Y	PRINTING	4																4	Y	PRINTING	.00
	TOTAL REIMB	9363	2454	2280	73	37		12	13	403	9		188	1578				16227			.22
	SAG % OF REIMB	.57	.15	.14	.00	.00	-	.00	.00	.02	.00	.00	.01	.10							

TOTAL DOLLARS ALL SOURCES

		MISSION MI	UTILITIES FC	FIRE/ ENG SUPP FD	ADMIN FF	SUPPLY FG	BACHELOR HOUSING FJ	EEO/ FAM SVCE FK	MAR FL	TELEPHONE FN	TRANS FR	HAZ WASTE FT	SECURITY FV	REPAIR REAL PROP FA/M1	MINOR CONST FB/M1	SPEC PROJ FA/M2	SPEC PROJ FB/M2	TOTALS			EXPENSE % OF TOTAL
E	TRAVEL	2074	0	3	79	2	0	1	1	0	3	2	0	3	0	0	0	2168	E	TRAVEL	.03
L	TRANSPORTATION	185	0	150	7	0	0	0	0	0	0	0	0	0	0	0	0	342	L	TRANSPORTATION	.00
M	UTILITIES	10	3732	64	0	0	0	1	0	0	4	0	0	53	0	0	0	3864	M	UTILITIES	.05
N	COMMUNICATIONS	0	0	40	0	0	0	0	0	1011	0	0	0	1	0	0	0	1052	N	COMMUNICATIONS	.01
P	EQUIPMENT MAINT	849	0	248	27	14	0	0	0	2	0	0	0	0	0	0	0	1140	P	EQUIPMENT MAINT	.02
Q	PURCH SERVICES	6143	0	2656	71	3	123	207	621	4	40	24	1	1510	131	2423	553	14465	Q	PURCH SERVICES	.20
R	AIRCRAFT POL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R	AIRCRAFT POL	.00
T	SUPPLIES	1821	22	264	484	18	3	57	0	34	71	0	10	896	64	0	0	3664	T	SUPPLIES	.05
U	LABOR	32677	164	1538	2101	1237	0	125	33	63	111	0	591	2752	36	0	0	41428	U	LABOR	.57
V	POL	0	5	8	0	0	0	0	0	0	26	0	0	38	0	0	0	77	V	POL	.00
W	EQUIPMENT	4282	0	212	42	5	9	34	0	12	1	0	6	84	0	0	0	4687	W	EQUIPMENT	.06
Y	PRINTING	35	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	44	Y	PRINTING	.00
	TOTAL $ BY SAG	48876	3923	5252	2731	1279	122	425	655	1126	256	26	608	5337	231	2488	553	72991			
	SAG % OF TOTAL	.66	.05	.07	.04	.02	.00	.01	.01	.02	.00	.00	.01	.07	.00	.03	.01				

Exhibit 4-9 (CONTINUED)

which is equal to the second component, is $16,671,000 as identified in Table 4-17.

The third component of the G&A pool is other support labor not identified in BOS and MRP (Exhibit 4-9). This includes identified military pay for line managers 00, 02 and 04 plus other military pay not directly traceable to a particular line manager. Also included is the civilian pay for line manager 05 (Dean of Info/Computer Services). The total for the third component equals $8,763,803 as identified in Table 4-18.

Total G&A expenses to allocate are equal to the summation of the G&A components outlined above. This aggregation is shown below.

Component I	Non-Labor	$ 1,665,675
Component II	BOS & MEP	$16,671,000
Component III	Other	$ 8,763,803
Total G&A to allocate		$27,071,448

2. Allocation of G&A Costs

The activities which shall be allocated to G&A expenses are the academic departments and the majority of tennant activities. This was discussed in greater detail in Chapter III.

Allocation of G&A expenses is a two-step process. The first step is to allocate G&A expenses to the various academic departments and tennant activities using the total number of

TABLE 4-17

COMPONENT II OF G&A POOL

BOS

SAG	Amounts	
FC--Utilities	$1,469,000	
FD--Fire/Eng Support	2,602,000	
FF--Admin	2,053,000	
FG--Supply	1,212,000	
FJ--Bachelor Housing	60,000	
FK--EEO/FAM SVCE	413,000	
FL--MWR	472,000	
FN--Telephone	723,000	
FR--Transportation	228,000	
FT--HAZ Waste	16,000	
FV--Security	459,000	
Total BOS		$9,707,000

MRP

FA/M1--Repair Real Property	3,767,000	
FB/R1--Minor Construction	231,000	
FA/M2--SPEC Projects	2,408,000	
FB/R2--SPEC Projects	558,000	
Total MRP		6,964,000
Total Component II		$16,671,000

Note: Source document for this data is Exhibit 4-9.

TABLE 4-18

COMPONENT III OF G&A POOL

G&A Labor Costs

Civilian Labor Costs

Code 05: Office of the Dean of Information and Computer Services

Annual Civilian Staff costs from Exhibit 4-8:

2,020,258	
X 1.225	Fringe
2,474,816	

Civilian labor costs for Codes 00, 02 and 04 are included in MTP data under BOS (these data include fringe benefits).

Military Labor Costs. We determined military labor costs for these codes by applying appropriate composite payrates to a current Staff Roster.

Code 00: Office of the Superintendent

# X Paygrade (Service)	X	Composite Payrate	=	Total Cost
1 X 08 (USN)		$135,861		$135,861
1 X 06 (USN)		109,474		109,474
1 X 05 (USN)		92,824		92,824
1 X 03 (USN)		67,045		67,045
1 X E6 (USN)		37,812		37,812
1 X E3 (USN)		21,654		21,654
Total				$464,670

Code 02: Director of Resource Management

# X Paygrade (Service)	X	Composite Payrate	=	Total Cost
1 X 05 (USN)		$92,824		$92,824

TABLE 4-18 (CONTINUED)

Code 04: Director of Military Operations

# X Paygrade (Service)	X	Composite Payrate	=	Total Cost
2 X 06 (USN)		$135,861		$271,722
7 X 05 (USN)		92,824		649,768
3 X 04 (USN)		78,720		236,160
2 X 03 (USN)		67,045		134,090
1 X 02 (USN)		51,585		51,585
1 X W4 (USN)		74,006		74,006
1 X E9 (USN)		61,445		61,445
4 X E7 (USN)		44,693		178,772
1 X E6 (USN)		37,812		37,812
2 X E5 (USN)		31,243		62,486
Total				$1,757,846

Enlisted Labor Not Otherwise Accounted for by Staff Code

Not all enlisted personnel assigned to NPS were included on staff rosters for each line manager code. However, the overwhelming majority of enlisted labor is attributable to Code 04 as these personnel work mainly to support the general functioning of the base. Thus the following entries was derived by accessing a current enlisted personnel listing for NPS and excluding those persons previously identified with other line manager codes.

# X Paygrade (Service)	X	Composite Payrate	=	Total Cost
1 X E9 (USN)		$61,445		$61,445
3 X E8 (USN)		51,932		155,796
7 X E7 (USN)		44,693		312,851
20 X E6 (USN)		37,812		756,240
33 X E5 (USN)		31,243		2,362,044
11 X E4 (USN)		25,633		281,963
2 X E3 (USN)		21,654		43,308
Total				3,973,647
TOTAL COMPONENT III				$8,763,803

personnel as the basis of allocation. Recall from Chapter II that the Unit Cost Guidance requires allocation of G&A expenses on the basis of total personnel. Since the primary

purpose of any unit cost methodology applied to NPS is to determine the unit cost of graduate education and provide cost information for academic departments, all tennant activities were lumped together for the purpose of allocating G&A costs. If tennant activities are to be properly costed in the future for reimbursement purposes, then each tennant must be separately costed. The allocated expense for any given tennant activity could be determined by using the number of personnel in the tennant activity (Table 4-19) as the numerator and the total number of personnel in Table 4-20 as the denominator and then multiplying that fraction by the total amount of G&A expenses to be allocated.

Multipliers derived from total personnel data can be used to allocate G&A expenses. Multipliers for each academic department and the sum of all tennant activities is shown in Table 4-21. These multipliers were derived by using the number of personnel in a particular academic department as the numerator and the total number of personnel for all activities that will be allocated to G&A expenses as the denominator.

TABLE 4-19

NUMBER OF PERSONNEL IN TENNANT ACTIVITIES

Activity	Military	Civilian	Total
Dental	8	2	10
DIS	0	17	17
DMDC	8	105	113
DRMEC	21	2	23
FLENUMOCEANCEN	132	163	295
NOAA (Ocean Applications)	0	10	10
NOAA (Fisheries)	1	10	11
NOARL	10	57	67
ROICC	11	111	122
NIS	0	4	4
NAV Reserve Center	9	1	10
Off Naval Research	0	4	4
NTTC	22	0	22
PSD	19	15	34
TRADOC	8	2	10
Total	249	503	
Total Military and Civilian			752

NOTE: NAV SEC GROUP, NAV MED, and PERSEREC were excluded due to the limited support they receive.

Example of step one is shown below for The AA Department.

$$\frac{\text{\# personnel in AA}}{\text{Total \# personnel}} \times \text{Total G\&A expenses to be allocated}$$

$$= \frac{40}{1149} \times \$27,071,448 = .0348 \times \$27,100,478$$

$$= \$859,085$$

TABLE 4-20

NUMBER OF PERSONNEL FOR G&A ALLOCATION BASIS

Activity	# Personnel
AA	40
AS	74
CS	40
EC	67
MA	28
ME	40
MR	38
NS	31
OC	43
OR	53
PH	56
Tennants	752
Total personnel	1262

Note: Total number of personnel for academic departments were established by averaging the number of civilian employees in FY90 based on monthly Personnel Strength Reports (Exhibit 4-10) and adding the number of military instructors teaching, as of 1 APR 91 from NPS Military Faculty List. Lack of sufficient records with regard to FY90 military personnel numbers necessitated use of current data. Number of personnel at tennant activities was also hampered by lack of data, thus was determined by personally calling each tennant activity to establish a head count.

TABLE 4-21

G&A ALLOCATION MULTIPLIERS BASED ON NUMBER OF PERSONNEL

AA	40/1262	=	.0217
AS	74/1262	=	.0586
CS	40/1262	=	.0317
EC	67/1262	=	.0531
MA	28/1262	=	.0222
ME	40/1262	=	.0317
MR	38/1262	=	.0301
NS	31/1262	=	.0246
OC	43/1262	=	.0340
OR	53/1262	=	.0420
PH	56/1262	=	.0444
Tennants	752/1262	=	.5959
			1.0000

NAVAL POSTGRADUATE SCHOOL
FY 90 PERSONNEL STRENGTH REPORT AS OF 30 SEP 90

BC	ORGANIZATION	GS & WG PERM	GS & WG TEMP	FACULTY PERM	FACULTY TEMP	TOTAL
00	SUPT (00)	1				1
	COMPT (002)	29	1			30
	MGT ANAL & PROG (003)	3				3
	CIV PERS (004)	17				17
	SAFETY (005)	6				6
	SJA (006)	1				1
	EEO (009)	2				2
	SUBTOTAL	59	1			60
01	PROVOST (01)	1		1		2
	OIR OF RSCH ADMIN (012)	8		1		9
	OIR ACAD PLAN (013)	4				4
	OIR COMP & INFO SYS (014)	8				8
	COMPUTER CEN (0141)	29	3	1		33
	LIBRARY (0142)	27		1		28
	C3 GRAD CURRIC (CC)	1		1		2
	ASW GROUP (EW)					
	SPACE SYS ACAD GP (SP)	5	1			6
	SUBTOTAL	83	4	5		92
03	OIR PROG (03)	2				2
	INT ED COOR (0305)	3				3
	MARINE CORPS REP (0309)					
	GRAD ED CIV INST (031)	2				2
	AVN SAFETY (034)	2		3		5
	ED MEDIA (036)	12	1			13
	ASW PROG (3A)	1				1
	OPS ANAL (30)	2				2
	AERO ENG (31)	1				1
	ELEC COMM (32)	1				1
	WEPS ENGR (33)	1				1
	NAV ENGR (34)	1				1
	AIR-OCEAN (35)	2				2
	ADMIN SCI (36)	1				1
	COMP TECH (37)	1				1
	NAVY INTEL (38)	3				3
	JOINT C3 GROUP (39)	2				2
	SUBTOTAL	37	1	3		41
04	OIR MIL OPS (04)	1				1
	PAO (042)	2				2
	SECURITY MGR (043)	2				2
	MIL PERS (411)					
	CORRES & REC (412)	8	1			9
	SUPPLY (42)	38	1			39
	PUB WORKS (43)	100	20			120
	SECURITY GD (441)	20	3			23
	FIREFIGHTER (443)	20	2			22
	RECREATION (45)	2				2
	CHAPLAIN (46)	1				1
	FAMILY SERVICES (47)	1				1
	SUBTOTAL	195	27			222
07	DEAN FAC & GRAD STUD (07)	8	1	2		11
	AERO (AA)	16	1	22		39
	ADMIN SCI (AS)	12	1	50	7	70
	COMPUTER SCI (CS)	13		20	2	35
	ELEC & COMP ENG (EC)	21	2	43	3	69
	MATHEMATICS (MA)	1		27	2	30
	MECH ENG (ME)	13		27	2	42
	METEOR (MR)	19	1	16	1	37
	NAT'L SEC AFF (NS)	3	1	24	2	30
	OCEAN (OC)	17	2	20	2	41
	OPS RSCH (OR)	9	1	36	1	47
	PHYSICS (PH)	25	3	28	1	57
	SUBTOTAL	157	13	315	23	508
	TOTAL	531	46	323	23	923

Note: Only used number of personnel in academic departments. This is only one month's report. Figures for number of personnel in Table 4-19 were derived by averaging the monthly total of personnel for FY90.

Exhibit 4-10 Naval Postgraduate School FY 90 Personnel Strength Report

Table 4-22 summarizes the allocation of G&A expenses to the academic departments and tennant activities.

TABLE 4-22

ALLOCATION OF G&A EXPENSES

Activity	Allocation of G&A Expenses (Components I + II + III)				
AA	.0317	X	$27,100,478	=	$859,085
AS	.0586	X	27,100,478	=	1,588,088
CS	.0317	X	27,100,478	=	859,085
EC	.0531	X	27,100,478	=	1,439,036
MA	.0222	X	27,100,478	=	601,631
ME	.0317	X	27,100,478	=	859,085
MR	.0301	X	27,100,478	=	815,724
NS	.0246	X	27,100,478	=	666,672
OC	.0340	X	27,100,478	=	921,416
OR	.0420	X	27,100,478	=	1,138,220
PH	.0444	X	27,100,478	=	1,203,261
Tennants	.5959	X	27,100,478	=	16,149,175
					$27,100,478

The second step involves dividing the amount of G&A expenses allocated to an academic department between instruction and research. The basis of allocation for this step is man-years (MY's) by department. Recall that man-year data for each academic department was originally obtained from Exhibit 4-7. Table 4-23 gives the total number of MY's for each department, broken into three categories (DTY, DRY, RRY); one for instruction and two for research, respectively. The two

research categories were combined (DRY + RRY) to give the total number of MY's devoted to research.

TABLE 4-23

SUMMARIZATION OF FY 90 MAN-YEAR DATA

Academic Department	DTY	DRY	RRY	(DRY + RRY)	Total
AA	12.18	7.43	1.68	9.11	21.28
AS	34.56	9.72	6.29	16.01	50.57
CS	12.79	6.66	1.89	8.55	21.34
EC	22.44	12.40	3.81	16.21	38.65
MA	19.84	3.85	2.04	5.89	25.73
ME	14.48	9.28	2.70	11.98	26.46
MR	6.75	7.42	2.18	9.60	16.35
NS	17.07	3.76	2.63	6.39	23.46
OC	8.49	10.25	0.84	11.09	19.59
OR	20.12	7.51	4.81	12.32	32.43
PH	15.75	8.25	3.84	12.09	27.85
Total	184.47		119.24	303.71	

The amount of departmental G&A expenses that should be allocated to instruction can be determined by using the instruction MY's (DTY) as the numerator and total MY's for a particular academic department (DTY + DRY + RRY) as the denominator and multiplying that fraction by the amount of G&A expenses allocated to the academic department in step one. To obtain the portion of the department G&A expenses that should be allocated to research, simply use the combined total for research (DRY + RRY) as the numerator. Recall that in Section

paragraph B1 multipliers, which represent the fractions discussed above, were established in a similar manner. Multipliers for allocating an academic department's G&A cost to instruction and research for that department are given in Table 4-24. Example of step two is given below, again using academic department AA.

TABLE 4-24

G&A DEPARTMENTAL MULTIPLIERS (TO ALLOCATE AN ACADEMIC DEPARTMENT'S SHARE OF G&A COST TO INSTRUCTION AND RESEARCH)

Academic Department	Instruction Multiplier	Research Multiplier
AA	12.18/21.28 = .5724	9.11/21.28 = .4276
AS	34.56/50.57 = .6834	16.01/50.57 = .3166
CS	12.79/21.34 = .5993	8.55/21.34 = .4007
EC	22.44/38.65 = .5806	16.21/38.65 = .4194
MA	19.84/25.73 = .7711	5.89/25.73 = .2289
ME	14.48/26.46 = .5472	11.98/26.46 = .4528
MR	6.75/16.35 = .4129	9.60/16.35 = .5871
NS	17.07/23.46 = .7276	6.39/23.46 = .2724
OC	8.49/19.59 = .4334	11.09/19.59 = .5666
OR	20.12/32.43 = .6204	12.32/32.43 = .3796
PH	15.75/27.85 = .5655	12.09/27.85 = .4345

Note: For purposes of computation, research multipliers were obtained by subtracting the instruction multiplier from 1.00.

Amount of AA Dept's G&A Cost Allocated to Instruction:

$$= \frac{DTY_{AA}}{(DTY + DRY + RRY)_{AA}} \text{ X G\&A cost of academic department AA}$$

$$= \frac{12.18}{21.28} \text{ X } \$859,085$$

$$= .5724 \text{ X } \$859,085$$

$$= \$491,740$$

Allocation of G&A expenses to instruction and research for each academic department is presented in Table 4-25.

D. UNIT COST

Developing a unit cost for a unit of output is simply a matter of determining the total cost associated with the production of a given output and dividing that amount by the total workload in units. Recall from Chapter II:

$$\text{Unit Cost} = \frac{\text{Total Cost}}{\text{Total Workload in units}} = \text{Cost per unit}$$

As stated in Chapter II, we developed a surrogate measure of output for the number of graduates: namely, average number of students onboard (AOB). We also indicate that we would not attempt to develop a measure of output for research. Therefore we will develop a unit cost for the cost objective of instruction, and not research.

TABLE 4-25

ALLOCATION OF ACADEMIC DEPARTMENT G&A EXPENSES
TO INSTRUCTION AND RESEARCH

Academic Department	Allocation of Academic Departments' G&A Expenses	Instruction Blocks 133-143
AA	.5724 X $859,085	$491,740
AS	.6834 X 1,588,088	1,085,299
CS	.5993 X 859,085	514,850
EC	.5806 X 1,439,036	835,504
MA	.7711 X 601,631	463,918
ME	.5472 X 859,085	470,091
MR	.4129 X 666,672	336,812
NS	.7276 X 921,416	485,071
OC	.4334 X 1,138,220	399,342
OR	.6204 X 1,203,261	706,152
PH	.5655 X 1,318,380	680,444
Total		$6,469,223
	Research	Blocks 144-155
AA	.4276 X $859,085	$367,345
AS	.3166 X 1,588,088	502,789
CS	.4007 X 859,085	344,235
EC	.4194 X 1,439,036	603,532
MA	.2289 X 601,631	137,713
ME	.4528 X 859,085	388,994
MR	.5871 X 815,724	478,912
NS	.2724 X 666,672	181,601
OC	.5666 X 921,416	522,074
OR	.3796 X 1,138,220	432,068
PH	.4345 X 1,203,261	522,817
Total		$4,482,080
Tennant (Block 155)		$16,149,175

The first step involves determining the total cost of instruction. The second step is to determine the number of AOB for FY90.

The total cost of instruction is shown in the completed unit cost matrix (Figure 4-1). It is simply the aggregation of labor, non-labor, and G&A expenses associated with instruction: this total is $34,865,892.

Determining the number of average onboard students (AOB) was accomplished by totaling the number of students, U.S. and international, enrolled for each of the four quarters in FY90 and dividing that total by four. Our information was obtained from the Office of the Director of Students and Programs. The reporting format that tracked the number of students enrolled was under revision in FY90. Consequently, we have not included a sample report as an exhibit, rather we simply aggregate the total of students by quarter, shown below.

Time Period	#U.S. Students	#Int'l Students	Total
Oct-Dec 89	1562	301	1863
Jan-Mar 90	1569	262	1831
Apr-Jun 90	1518	261	1779
July-Sep 90	1695	254	1949
	6344	1078	7422

Dividing the total for the four quarters (7422) will produce the AOB for FY90. This amount is equal to: 7422 ÷ 4 = 1856. We combined the U.S. students and international students because we have not separately accounted for all Foreign Military Training funds. But we do believe that our report

	LABOR				NON-LABOR		G&A	TOTAL
	Civilian		Military					
	Direct	Indirect	Direct	Indirect	Direct	Indirect		
Primary:								
Instruction								
AA	1,523,880	119,193	145,765	123,418	119,799	239,892	491,740	$2,763,687
AS	2,636,676	338,021	593,352	350,433	60,639	681,132	1,085,299	5,745,552
CS	1,361,872	125,149	486,407	129,589	146,422	251,885	514,850	3,016,174
EC	2,255,095	219,618	380,882	227,389	162,471	441,986	835,504	4,522,945
MA	1,489,749	194,264	0	201,209	36,738	391,078	463,918	2,776,956
ME	1,530,407	141,771	0	146,793	91,189	245,321	470,091	2,665,572
MR	717,828	66,070	78,720	68,441	100,720	133,022	336,812	1,501,613
NS	1,190,768	167,050	92,824	172,973	47,325	336,211	485,071	2,492,222
OC	955,173	83,112	185,648	86,019	56,433	167,209	399,342	1,932,936
OR	1,961,207	196,965	718,408	204,014	105,986	396,527	706,152	4,289,259
PH	1,723,742	154,238	78,720	159,696	51,722	310,408	680,444	3,158,970
Total	17,346,397	1,805,451	2,760,726	1,869,974	979,444	3,634,677	6,469,223	34,865,892
Research								
AA	784,966	55,959	0	0	326,431	44,328	367,345	1,579,029
AS	1,460,366	98,341	0	0	193,844	77,914	502,789	2,333,254
CS	707,825	52,550	0	0	329,573	41,611	344,235	1,475,794
EC	1,324,972	99,567	0	0	373,722	78,859	603,532	2,480,652
MA	452,343	36,184	0	0	42,326	28,663	137,713	697,229
ME	892,459	73,565	0	0	429,308	58,296	388,994	1,842,622
MR	1,101,499	58,955	0	0	441,507	46,705	478,912	2,127,578
NS	395,884	39,225	0	0	178,809	31,088	181,601	826,607
OC	1,031,825	68,104	0	0	477,880	53,956	522,074	2,152,839
OR	1,048,511	75,690	0	0	225,851	59,944	432,068	1,842,064
PH	1,232,048	74,258	0	0	437,648	58,829	522,817	2,325,600
Total	10,432,698	732,398			3,456,899	4,214,870	4,482,080	23,318,945
Other:								
Tennant Support							$16,149,175	

Figure 4-1 Completed Unit Cost Matrix. Figures in Dollars

believe that our report captures a large portion of those funds in the direct instruction salaries section of the unit cost matrix as stated in Chapter III. Therefore, international students are included in the denominator to determine the unit cost per graduate.

Now that we have determined the total cost to be $34,875,892 and the AOB for FY90 to be 1856, simple division will give cost per graduate.

$$\frac{\$34,865,892}{1856} = \$18,786 \text{ per graduate}$$

This cost per graduate should not be construed as a point estimate. It is merely a rough approximation for the unit cost. Due to the scope of the thesis, we have not attempted to assess whether the unit cost per graduate is high or low.

Although we did not develop a unit cost for research, we did aggregate the cost associated with research. This amount can be found in the matrix (Figure 4-1) and is equal to $23,318,945, and a breakdown of this total by academic departments will provide a useful management tool to enhance the visibility of cost.

In the future it appears likely that NPS will be conducting a large portion, if not all, of its research on a reimbursable basis, and in accordance with the Unit Cost Resourcing Guidance, NPS should be reimbursed for the full cost of its research services. This means that activities

that sponsor faculty research at NPS should be charged for overhead costs to cover indirect costs and G&A expenses attributable to research. One common approach used in many civilian universities is to load the amount of direct labor dollars for research with an overhead charge. That is, overhead will be charged on the basis of direct labor dollars. The unit cost matrix provides the data to develop a crude overhead rate until a better rate can be established. This overhead rate is based on the amount of indirect and G&A expenses in relationship to the amount of direct labor expenses, as shown below.

$$\frac{\text{Indirect labor\$ + indirect non-labor\$ + G\&S\$}}{\text{Direct labor \$}}$$

from the Cost and Workload Analysis Report,

$$\frac{\$732,398 + \$4,214,870 + \$4,482,080}{\$10,432,698} = .90$$

So, for every dollar of direct labor dollars charged to a sponsoring activity, an overhead rate of 90% should be applied.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. ISSUES

Prior to developing the unit cost report presented in this thesis, several issues had to be resolved, namely:

1. What is the purpose of our unit cost framework?
2. What is the mission of the Naval Postgraduate School?
3. What should be considered the outputs of NPS, and how will that output be measured?
4. What expenditures should be included in the defined cost objectives, and how should those expenditures be classified and allocated?

These issues and their resolution are discussed below. The issues were resolved sequentially, since each issue hinged upon the preceding issues.

1. What is the Purpose of Our Unit Cost Framework?

As stated in the Introduction, there are two purposes for the framework presented in this thesis. First, it will provide costing information to enhance the visibility of costs. The costing information will provide an additional managerial tool, which will hopefully lead to more effective management of resources. Second, it will determine the cost per graduate. This will enable the school to verify the unit cost per graduate generated by DMDC, which will be used to budget and fund activities at NPS. We developed a unit cost methodology capable of addressing both purposes by defining

the cost objectives necessary for internal costing information as instruction and research for each academic department, plus the summation of tennant activities as an additional cost objective. This provides visibility of cost by academic departments. Additionally, this enabled us to develop a unit cost per graduate by simply aggregating the academic departmental instruction cost and the academic departmental research cost, to develop a unit cost for instruction and the amount of block or reimbursable funding required for research and tennant support.

2. What is the Mission of the Naval Postgraduate School?

Having defined the purposes of our unit cost framework, it was then necessary to establish what the purpose or mission of the Naval Postgraduate School was, that is, what should be costed? The purpose of NPS as defined by the Secretary of the Navy is to increase the combat effectiveness of the Navy and the Marine Corps. This is accomplished by providing post-baccalaureate degree and non-degree programs, and through continuing programs of naval and maritime research. Contributions to improvement in combat effectiveness are difficult to measure or cost. Consequently, we chose instruction and research as the primary functions to be costed.

3. What Should be Considered the Output, and How will That Output be Measured?

Having established instruction and research as the primary functions to be costed, we then examined measures of output for both functions. The Unit Cost Guidance stipulates that the "number of graduates" shall be the output measure for training facilities. Thus, the output for instruction was given. However, measuring the number of graduates was not very simple. There are a number of degree and non-degree programs of varying length. Because of the varying length of programs, counting the graduates in any one year would not accurately reflect the workload in that year. In some years the workload would be understated, in other years the workload would be overstated. For instance, if 200 students enter the school for an 18-month program at the beginning of the year, they will not be counted as a measure of output for that year (understated workload), but would be counted the following year, although they only received instruction for six months (overstated workload). We decided that a more representative measure of output for graduates would be the average number of students enrolled for a given year, which we called average onboard (AOB).

As Chapter II pointed out, determining an output measure for research is a difficult task. We concluded that no appropriate measure could be devised to suit our framework. Therefore we did not develop a unit cost for research. We

did, however, define research by academic departments as a cost objective, thereby enhancing the visibility of cost associated with research. To be consistent with DOD guidance, research activities at NPS may eventually be funded on a reimbursable basis. This then raises questions of how much to charge sponsors of that research.

4. What Expenditures Should be Included in the Defined Cost Objectives, and How Should Those Expenditures be Classified and Allocated?

Due to the scope of our thesis and limited accounting data, we decided that only direct funded money would be allocated to the cost objectives, with the exception of salary money received for reimbursable research and Foreign Military Training Funds received for instruction. Justification for the inclusion of these funds was described in Chapter III. The remaining portions of reimbursable and Foreign Military Training funds were ignored since their impact on the true cost per output was unclear. It was not possible to include depreciation and the cost of support services provided to NPS by PSD and others.

As described in Chapter II, expenditures that could be directly traced to a cost objective, were so assigned. Expenditures that benefit instruction and/or research for all academic departments were allocated as indirect cost using the man-years data for instruction and research as shown in Chapter IV. Finally, expenditures which benefitted all the cost objectives were allocated as G&A expenses using the total

number of personnel as an allocation basis, as prescribed in the Unit Cost Guidance.

B. CONCLUSIONS

We attempted to reconcile financial accounting and cost accounting by developing an approach for translating financial data to cost data. The unit cost matrix we used illustrates the breakdown of data needed. Unfortunately, we found no single accounting report that provided all of the information necessary for unit cost analysis. We were unable to directly translate the financial data to cost accounting data. An intermediate step was required prior to the translation process. This step involved analyzing various financial accounting reports and deciding which reports or portions thereof would provide the information necessary to complete the unit cost matrix. Once this was accomplished, we were able to begin the translation process.

Unfortunately, the reports capable of providing the needed cost information overlapped because they accounted for many of the same funds. We were, therefore, forced to make several assumptions to disaggregate our chosen reports to alleviate the overlap-ping problem. Consequently, our unit cost determination became somewhat complicated and cumbersome. However, we do believe our approach captures the essence of unit costing as dictated in the Unit Cost Guidance and our

completed cost matrix provides a valuable tool to middle and senior management that helps in identifying and monitoring departmental cost drivers.

In summary, our unit cost methodology is too complicated to be implemented as a standard accounting procedure. It does, however, lay the ground work for further refinement and simplification. Additionally, it may be used as an intermediary method of unit costing until the financial accounting structure can be modified to accommodate unit cost requirements.

C. RECOMMENDATIONS

We recommend that the existing financial accounting structure be slightly modified to accommodate newly established unit costing requirements. We believe that the basic framework is in place to accomplish the modification with relative ease.

Non-labor dollars are currently tracked by job order numbers for each sub-cost center. This format makes it easy to identify the expenditures of a given sub-cost center. It also facilitates the aggregation of expenditures for a given cost center (i.e., line manager). Tracking labor dollars for instruction, research and administrative support activities in much the same manner, would enhance the visibility of those costs for middle and senior management. We realize that labor

dollars for instruction and research can be obtained unofficially from the Director of Academic Planning, but we believe a single format would be easier to understand and translate to cost accounting data. Additionally, Base Operating Support (BOS) could be structured in a similar manner.

We also recommend that the organizational structure at NPS be carefully evaluated to assess the possibility of reassigning certain sub-cost centers to facilitate the translation of financial accounting data to cost accounting data. If possible, all sub-cost centers for a given cost center (line manager) should have some theoretical cost classification. For instance, if a particular sub-cost center's expenditures only benefit the academic departments, those expenditures should be allocated as indirect, but if the sub-cost center is assigned to a line manager with mostly G&A expenses, its expenditures will be allocated as G&A expenses rather than indirect cost.

D. TOPICS FOR FURTHER RESEARCH

We suggest five major topics for further research, namely: output measures, G&A allocation basis, reimbursables, cost objectives, and capital investment and depreciation.

First, DOD has dictated that graduates will be the measure of output for training commands. This is logical, since the primary mission normally assigned a training command is the education of students in a particular skill or field. The

successful completion of this training is signified by graduation. However, a problem arises when students do not graduate in the year they enroll. Students arriving late in a given year that do not graduate in that year would not be counted as part of the workload or output for that year. Therefore, we chose to use the average number of students onboard for a given year as defined in Chapters II and III. However, we realize that this may not satisfy the unit costing requirements set forth by DOD in the Unit Cost Guidance or may not be the best output measure available to indicate actual workload. It has been suggested that credit hours as a measure of output would more closely reflect the actual workload of NPS. In any case, the issue requires further study.

Second, the Unit Cost Guidance stipulates that G&A expenses be allocated on the basis of total number of personnel. It is unclear whether or not using this allocation basis accurately distributes G&A expenses to the cost objectives. Labor-intensive activities such as Fleet Numerical Oceanography Center may be allocated an excessively large portion of the G&A expense pool. On the other hand, activities with few employees that use a lot of computer time may not be allocated a sufficient amount of G&A expenses. This problem can be approached from two perspectives. One, attempt to identify expenses we classified as G&A as either direct or

indirect. Two, attempt to identify a better causal relationship between G&A expenses and the cost objectives.

Third, how should reimbursables be treated? Theoretically, NPS should reimburse activities that perform services for the school and those costs should be allocated to NPS cost objectives. For instance, the Personnel Support Detachment located at NPS is a tennant activity that provides services for NPS and should therefore be reimbursed for those services. However, this was beyond the scope of our thesis, and we did not include the cost of services received under the circumstances described above. Further research in this area is warranted.

Fourth, it may be useful to use curricula vice academic departments as cost objectives. This would enhance the visibility of cost in greater detail than our matrix does. However, two major problems would be encountered in such an approach: (1) Many instructors teach classes that support more than one curriculum, and (2) Students taking a particular course are often assigned to various curricula.

Fifth, the Unit Cost Guidance requires the allocation of depreciation expenses to the cost objectives as part of the cost per output. This presented no problem for us in our analysis of FY90 data, since only depreciation of improvements, buildings, and equipment completed after 01 October 1990 are to be allocated to cost objectives. However, future unit cost study will have to address this issue.

Capital investments will continue to receive separate funding, but a method to track and control the funds would be useful.

APPENDIX A

FY91 OPERATING BUDGET SECTION ASSIGNED SUB-COST CENTERS

This appendix, referred to as Exhibit 4-4 in the text, is used to trace sub-cost centers identified in the NPS section of the Job Order Report to the appropriate line manager and/or academic department.

FY91 OPERATING BUDGET SECTION ASSIGNED SUB-COST CENTERS

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	00	SUPERINTENDENT	00	AA	AA000-AA999 0000-0010
FF	003	COMMAND EVAL	00	AB	AB000-AB999 0061-0070
FF	005	SAFETY	00	AC	AC000-AC999 0031-0040
FF	006	JAG	00	AD	AD000-AD999 0041-0050
FK	009	EEO	00	AE	AE000-AE999 0051-0060
MZ	01	PROVOST	01	BA	BA000-BA999 0111-0120
MZ	01S	1ST DUTY PCS	01	BB	BB000-BB999
MZ	01S	FACULTY PCS	01	BP	BP000-BP999
MZ-V1	05	DEAN OF COMPUTER	05	CA	CA000-CA999 0141-0150
MZ-V1	51	COMPUTER CENTER	05	CB	CB000-CB999 0151-0160
MZ	52	LIBRARY	05	CC	CC000-CC999 0161-0170
MZ-V1	54	ADP SECURITY	05	CD	CD000-CD999 0801-0810
MZ-V1	53	MIS	05	CE	CE000-CE999 0181-0190
MZ	51	05'S PCS	05	CF	CF000-CF999
MZ	03	DIR OF PROGRAMS	03	DA	DA000-DA999 0201-0210
MZ	031	CIV INST	03	DB	DB000-DB999 0211-0220
MZ-A7	034	AVIATION SAFETY	03	DC	DC000-DC999 0221-0230

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	032E	EMD	03	DD	DD000-DD999 0231-0240
MZ	032P	PRINT PLANT	03	DE	DE000-DE999 0241-0250
MZ	30	OPS RESEARCH	03	DF	DF000-DF999 0251-0260
MZ	31	AERO PROGRAMS	03	DG	DG000-DG999 0261-0270
MZ	32	EE/CE PROGRAMS	03	DH	DH000-DH999 0271-0280
MZ	33	WEAPONS ENG PROG	03	DJ	DJ000-DJ999 0281-0290
MZ	3A	ASW PROGRAMS	03	DK	DK000-DK999 0291-0300
MZ	34	NAVAL ENGINEERING	03	DL	DL000-DL999 0301-0310
MZ	35	AIR/OCN SYS PROG	03	DM	DM000-DM999 0311-0320
MZ	36	ADMIN SCI PROG	03	DN	DN000-DN999 0321-0330
MZ	37	COMPUTER TECH PROG	03	DP	DP000-DP999 0331-0340
MZ	38	NAVAL INTELL/NSA	03	DQ	DQ000-DQ999 0341-0350
MZ	39	C3 PROGRAM	03	DR	DR000-DR999 0351-0360
MZ	031L	LAW PROGRAM	03	DS	DS000-DS999 0371-0380
MZ	035	INTERNATIONAL	03	DT	DT000-DT999 0381-0390
MZ	03T	TEXTBOOKS	03	DU	DU000-DU999
MZ	03V	VEGEP	03	DV	DV000-DV999
MZ-A9	034M	COMMAND PHYSICIAN	03	DW	DW000-DW999 0091-0100

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	39T	C3 TRAVEL(ONLY)	03	DX	DX000-DX999
MZ	38B	SCIF	03	DY	DY000-DY999 0411-0420
FF	04	DIR OF MILITARY	04	EA	EA000-EA999 0421-0430
FF	41	ADMIN/CNTRL FILES	04	EC	EC000-EC999 0431-0440
FG	42	SUPPLY	04	ED	ED000-ED999 0441-0450
FK	42E	EDF	04	EE	EE000-EE999 0451-0460
FG	42M	MATERIAL DIV	04	EF	EF000-EF999 0461-0470
FV	441	POLICE	04	EH	EH000-EH999 0471-0480
FK	46	CHAPLAINS	04	EJ	EJ000-EJ999 0481-0490
FK	47	FAMILY SERVICES	04	EK	EK000-EK999 0491-0500
FL	45	RECREATION	04	EM	EM000-EM999
FJ	49	UPH OFFICE	04	EN	EN000-EN999 0521-0530
FL	45C	CHILD CARE CENTER	04	ER	ER000-ER999
FD	443	FIRE DEPARTMENT	04	ES	ES000-ES999 0541-0550
FF	04A	BASE OPS PCS	04	ET	ET000-ET999
FL	45G	GYM	04	EU	EU000-EU999
FL	45I	INTRAMURALS	04	EV	EV000-EV999 0561-0570
FF	43	BOAT	04	EW	EW000-EW999 0571-0580
FL	45I	YOUTH CENTER	04	EX	EX000-EX999

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
FN	43	TELEPHONE (L1)	4A	FA	FA000-FA999 1521-1570
FR	43	TRANS (L7)	4A	FB	FB000-FB999 1571-1620
FA	43	MAINT (M1)	4B	FC	FC000-FC999 1621-1720
FC	43	UTILITIES (N1)	4A	FD	FD000-FD999 1721-1770
FD	43	ENGINEERING (P1)	4A	FE	FE000-FE999 1771-1820
FB	43	MINOR CONST.(R1)	4B	FF	FF000-FF999 1821-1930
FA	43	MAINT (M2)	4C	FH	FH000-FH999
FB	43	CONSTRUCTION (R2)	4C	FJ	FJ000-FJ999
MZ	43K	AUDIO	04	FK	FK000-FK999 1931-1980
FT	43	HAZARDOUS	4D	FL	FL000-FL999 1981-2090
MZ	07	DEAN OF FACULTY	07	GA	GA000-GA999 0591-0600
MZ	CS	COMPUTER SCIENCE	07	GB	GB000-GB999 0601-0610
MZ	MA	MATH DEPARTMENT	07	GC	GC000-GC999 0611-0620
MZ	AS	ADMIN SCIENCE	07	GD	GD000-GD999 0621-0630
MZ	OR	OPS RESEARCH	07	GE	GE000-GE999 0631-0640
MZ	NS	NSA	07	GF	GF000-GF999 0641-0650
MZ	AW	ASW ACADEMIC GRP	07	GJ	GJ000-GJ999 0661-0670
MZ	EW	EW ACADEMIC GRP	07	GK	GK000-GK999 0671-0680

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	CC	C3 ACADEMIC GRP	07	GL	GL000-GL999 0681-0690
MZ	07	LAB MAINT	07	HA	HA000-HA999
MZ	PH	PHYSICS	07	HB	HB000-HB999 0711-0720
MZ	EC	ECE	07	HC	HC000-HC999 0721-0730
MZ	MR	METEOROLOGY	07	HD	HD000-HD999 0731-0740
MZ	AA	AERONAUTICS	07	HE	HE000-HE999 0741-0750
MZ	OC	OCEANOGRAPHY	07	HF	HF000-HF999 0751-0760
MZ	ME	MECHANICAL ENG	07	HG	HG000-HG999 0761-0770
MZ	OR	WAR LAB	07	HH	HH000-HH999 0771-0780
MZ	SP	SPACE SYS ACAD GRP	07	HJ	HJ000-HJ999 0781-0790
MZ	07	CASE STUDIES	07	HK	HK000-HK999 0791-0800
MZ	07	LAB/OTHER	07	HL	HL000-HL999 0881-0990
MZ	07S	PCS GS/WG	07	HP	HP000-HP999
MY	64	DRMEC (OMN) (65522)	64	JA	JA000-JA999 2991-3025
MY	64	DRMEC COM/PHONE (65522)	64	JB	JB000-JB999
W5	042	PAO SUBHEAD 1190	04	JC	JC000-JC999 3341-3360
FC	64	DRMEC OMN UTIL (65522)	64	JD	JD000-JD999
PH	65	PERSEREC (OMN) (68872)	65	JE	JE000-JE999 3141-3220

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MY	64	DRMEC FMT (65522)	64	JF	JF000-JF999 3041-3090
FN	64	DRMEC FMT-PHONES (65522)	64	JG	JG000-JG999
FC	64	DRMEC FMT-UTIL (65522)	64	JH	JH000-JH999
FD	64	DRMEC-CUSTODIAL SV (65522)	64	JJ	JJ000-JJ999
MZ/DA	0305A	FMT TRAVEL	FT	KA	KA000-KA999
FA/DA	43	FMT MAINT	FT	KB	KB000-KB999
FF/DA	211	FMT TEXTBOOKS	FT	KC	KC000-KC999
MZ/DA	03FM	FMT STUDENT TRAVEL	FT	KD	KD000-KD999
FL/DA	451F	FMT COM "O"	FT	KE	KE000-KE999
FF/DA	04	FMT MILOPS	FT	KF	KF000-KF999 0861-0870
FD/DA	43	FMT PW	FT	KG	KG000-KG999
FV/DA	44	FMT POLICE	FT	KH	KH000-KH999 0841-0850
FD/DA	443	FMT FIRE	FT	KJ	KJ000-KJ999 0831-0840
FG/DA	42	FMT SUPPLY	FT	KK	KK000-KK999 0851-0860
FG/DA	42M	FMT MAT DIV	FT	KL	KL000-KL999
FF/DA	21	FMT STAFF	FT	KM	KM000-KM999 0811-0820
MZ/DA	012	THESIS TYPING	FT	KQ	KQ000-KQ999
FJ/DA	49	FMT BOQ	FT	KR	KR000-KR999
FR/DA	43B	FMT TRANS	FT	KU	KU000-KU999

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
FF	21	COMPTROLLER	02	LB	LB000-LB999 0011-0020
FF	211	STAFF PCS	02	LC	LC000-LC999
MZ	211	OVERNIGHT MAIL	02	LD	LD000-LD999
FF	22	CIV PERSONNEL	02	LE	LE000-LE999 0021-0030
RA	211	INJURY COMP	02	LF	LF000-LF999
MZ	2211	TRAINING	02	LG	LG000-LG999 0121-0130
MZ	06	DEAN OF INSTRUC.	06	MB	MB000-MB999 0691-0700
MZ	08	DEAN OF RESEARCH	08	NB	NB000-NB999 0131-0140
MZ	08	DIR OF RESEARCH	08	NC	NC000-NC999 0391-0400

APPENDIX B

FY91 DIRECT FUNDED RESEARCH ASSIGNED SUB-COST CENTERS

This appendix, referred to as Exhibit 4-5 in the text, is used to trace sub-cost centers identified in the DFR section of the Job Order Report to the appropriate line manager and/or academic department.

February 8, 1991

FY91 DIRECT FUNDED RESEARCH ASSIGNED SUB-COST CENTERS

PROJECTS' SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	CS	COMPUTER SCIENCE	12	LA	LA000-LAZ99 4376-4468
MZ	MA	MATH	12	MA	MA000-MAZ99 4469-4560
MZ	AS	ADMIN SCIENCE	12	NA	NA000-NAZ99 4561-4652
MZ	OR	OPS RESEARCH	12	PA	PA000-PAZ99 4653-4744
MZ	NS	NSA	12	QA	QA000-QAZ99 4745-4836
MZ	PH	PHYSICS	12	RA	RA000-RAZ99 4837-4988
MZ	EC	ECE	12	SA	SA000-SAZ99 4989-5172
MZ	MR	METEOROLOGY	12	TA	TA000-TAZ99 5173-5272
MZ	AA	AERONAUTICS	12	UA	UA000-UAZ99 5273-5364
MZ	ME	MECHANICAL ENG	12	WA	WA000-WAZ99 5549-5640
MZ	OC	OCEANOGRAPHY	12	VA	VA000-VAZ99 5365-5548
MZ	AW	ASW ACAD GRP	12	XA	XA000-XAZ99 5641-5684
MZ	SP	SPACE SYS ACAD GRP	12	YA	YA000-YAZ99 5685-5732
MZ	EW	EW ACAD GRP	12	ZA	ZA000-ZAZ99 5733-5756
MZ	CC	C3 ACAD GRP	12	ZB	ZB000-ZBZ99 5757-5816

MZ	81	RESEARCH ADMIN	12	ZZ	ZZ000-ZZ999 5937-5987 2200-2400
MZ	434	PUBLIC WORKS SUPT	12	PW	PW000-PW999

CHAIRS

SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	CS	G. HOPPER CHAIR	CR	01	01000-01999 5817-5820
MZ	AS	MPTA CHAIR	CR	02	02000-02999 5821-5824
MZ	OR	COMB SYS ANALYS	CR	03	03000-03999 5825-5828
MZ	OR	TACTICAL ANALYS	CR	04	04000-04999 5829-5832
MZ	OR	APPLIED SCI SYS	CR	05	05000-05999 5833-5836
MZ	PH	UNDERWATER ACOUS	CR	06	06000-06999 5837-5840
MZ	EC	ELEC/ENG CHAIR	CR	07	07000-07999 5841-5844
MZ	MR	G HALTINER CHAIR	CR	08	08000-08999 5845-5848
MZ	OC	MC&G HYDROG CHAIR	CR	09	09000-09999 5849-5852
MZ	OC	NAV OCN CHAIR	CR	10	10000-10999 5853-5856
MZ	OC	ARCTIC MARINE SCI	CR	11	11000-11999 5857-5860
MZ	ME	ONT/ME CHAIR	CR	12	12000-12999 5861-5864
MZ	EW	ELECTRONC WARFARE	CR	13	13000-13999 5865-5868
MZ	CC	JOINT C3 CHAIR	CR	14	14000-14999 5869-5872
MZ	NS	STRATEG PLANNING	CR	15	15000-15999 5988-5991

MZ	SP	SPACE SYSTEMS	CR	16	16000-16999 5992-5995

INDIRECT SAG	CODE	DEPARTMENT	COST CENTER	SUB-COST CENTER	DOCUMENT SERIAL NUMBERS
MZ	CS	COMPUTER SCIENCE	ND	LZ	LZ000-LZ999 5873-5876
MZ	MA	MATHEMATICS	ND	MZ	MZ000-MZ999 5877-5880
MZ	AS	ADMIN SCIENCE	ND	NZ	NZ000-NZ999 5881-5884
MZ	OR	OPS RESEARCH	ND	PZ	PZ000-PZ999 5885-5888
MZ	NS	NSA	ND	QZ	QZ000-QZ999 5889-5892
MZ	PH	PHYSICS	ND	RZ	RZ000-RZ999 5893-5896
MZ	EC	ECE	ND	SZ	SZ000-SZ999 5897-5900
MZ	MR	METEOROLOGY	ND	TZ	TZ000-TZ999 5901-5904
MZ	AA	AERONAUTICS	ND	UZ	UZ000-UZ999 5905-5908
MZ	OC	OCEANOGRAPHY	ND	VZ	VZ000-VZ999 5909-5912
MZ	ME	MECHANICAL ENG	ND	WZ	WZ000-WZ999 5913-5916
MZ	AW	ASW ACADEMIC GRP	ND	XZ	XZ000-XZ999 5917-5920
MZ	SP	SPACE SYS ACAD GRP	ND	YZ	YZ000-YZ999 5921-5924
MZ	81	RESEARCH ADMIN	ND	ZW	ZW000-ZW999 5933-5936
MZ	CC	C3 ACADEMIC GRP	ND	ZX	ZX000-ZX999 5929-5932
MZ	EW	EW ACADEMIC GRP	ND	ZY	ZY000-ZY999 5925-5928

APPENDIX C

FY91 ADP JOB ORDERS OPERATING BUDGET

This appendix, referred to as Exhibit 4-6 in the text, identifies job order number cost classifications.

SECTION III

FY 91 OPERATING BUDGET JOB ORDERS
NON-ADP

SUB COST CENTER:_____
SERIAL NO:_____
STANDARD STOCK NO:_____

E_ _ 0C	CIVILIAN TRAVEL
E_ _ 0M	MILITARY TRAVEL
E_ _ EP	CIVILIAN PCS TRAVEL
E_ _ MR	RENTAL LEASE OF VEHICLE (NON-TDY)
E_ _ TT	INVITATIONAL TRAVEL
L_ _ 00	TRANSPORTATION OF THINGS
L_ _ HG	MOVEMENT OF HOUSEHOLD GOODS
M_ _ 00	EQUIPMENT RENTAL/LEASE
P_ _ MM	MAINTENANCE MINOR PROPERTY
P_ _ PM	MAINTENANCE PLANT PROPERTY
Q_ _ 00	TRAINING COSTS
Q_ _ QR	REGISTRATION FEE/CONFERENCE COSTS
Q_ _ QH	HONORARIUMS
Q_ _ QS	PURCHASE SERVICES, OTHER
T_ _ 00	CONSUMABLE SUPPLIES - NOT ADP, RSS, GSA, OR NSC
T_ _ GS	GSA SUPPLIES (1348'S)
T_ _ NS	NAVY STOCK SUPPLIES (RSS AND NSC)
T_ _ PR	PERIODICALS/SUBSCRIPTIONS
U_ _ QT	60 DAY TEMPORARY QTRS SUBSISTENCE
U_ _ RE	PCS REAL ESTATE EXPENSES
W_ _ BK	HARD COVER BOOKS
W_ _ MA	MINOR PROPERTY (NOT ADP OR STOCK)
W_ _ MG	GSA MINOR PROPERTY
W_ _ NM	NAVY STOCK MINOR PROPERTY
W_ _ PA	PLANT PROPERTY
W_ _ PG	GSA PLANT PROPERTY
W_ _ PN	NAVY STOCK PLANT PROPERTY
Y_ _ 00	COMMERCIAL PRINTING

FY91 ADP JOB ORDERS
OPERATING BUDGET

SUB COST CENTER:_____
SERIAL NO:_____
STANDARD STOCK SERIAL NO:_____

NAVY STOCK SYSTEM (NSC, RSS, OSI):

T_ _	AD	ADP CONSUMABLE SUPPLIES
W_ _	NS	ADP MINOR PROPERTY - NEW
W_ _	NR	ADP MINOR PROPERTY - REPLACEMENT
W_ _	NP	ADP PLANT PROPERTY - NEW

GSA STOCK SYSTEM (NOT GSA CONTRACTS!):

T_ _	GP	ADP CONSUMABLE SUPPLIES
W_ _	GS	ADP MINOR PROPERTY - NEW
W_ _	GE	ADP MINOR PROPERTY - REPLACEMENT
W_ _	GP	ADP PLANT PROPERTY - NEW
W_ _	GR	ADP PLANT PROPERTY - REPLACEMENT

OPEN PURCHASE (NOT SOFTWARE):

T_ _	DP	ADP CONSUMABLE SUPPLIES (ALSO ANY SOFTWARE UNDER $50.)
W_ _	MD	ADP MINOR PROPERTY - NEW
W_ _	MR	ADP MINOR PROPERTY - REPLACEMENT
W_ _	PD	ADP PLANT PROPERTY - NEW
W_ _	PR	ADP PLANT PROPERTY - REPLACEMENT

SOFTWARE OPEN PURCHASE:

W_ _	SW	ADP APPLICATIONS SOFTWARE - OFF THE SHELF
W_ _	CA	ADP APPLICATIONS SOFTWARE - CUSTOM
W_ _	AC	ADP OPERATING SYSTEMS AND COMMUNICATIONS SOFTWARE - OFF THE SHELF

SERVICES AND REPAIR:

P_ _ MD	MAINTENANCE ADP MINOR PROPERTY - HARDWARE LESS THAN $5000
P_ _ PD	MAINTENANCE ADP PLANT PROPERTY - HARDWARE MORE THAN $5000
P_ _ SW	MAINTENANCE ALL SOFTWARE
Q_ _ AD	COMMERCIAL ADP DEVELOPMENT/CONSULTING SVCS
Q_ _ DC	ADP DATA COMMUNICATIONS
Q_ _ DP	ADP CONTRACTS (WRITING OF SOFTWARE)
Q_ _ RP	ONE-TIME REPAIR OF ADP EQUIPMENT
Q_ _ SD	SYSTEMS DESIGN/DEVELOPMENT (HARDWARE)
Q_ _ TM	ADPE SYSTEM TIME CONTRACTS

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10. SECNAVINST 1524.2A, dated 27 March 1989. Subject: Policies concerning the Naval Postgraduate School.

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